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AMERICAN SOCIETY

OF

CIVIL ENGINEERS.

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American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. January, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 3D, 1877.—A regular meeting was held at 8 o'clock P. M.

Canvass fixed for this day, of the vote upon admission to membership was called for; reference was made to Art. XX, of the Constitution, whereby it is affirmed that "the results shall be announced at the next regular meeting held after thirty days have elapsed from the time of mailing the notification," and the canvass was deferred until the next regular meeting.*

A paper, by John T. Fanning, C. E., of Manchester, N. H., on "A Water Conduit under Pressure" was read.

The Chairman of the Committee on Finance presented the report of the Committee on the Report of the Treasurer for year ending October 31st, 1876, which was accepted and ordered to be published with accounts of receipts and expenditures of the Society during that period.

The death on December 14th, of George W. R. Bayley, C. E., late of New Orleans and Member of the Society from July 24th, 1872, was announced, and W. Milnor Roberts, Elmer L. Corthell and Caleb G. Forshey were appointed a committee to present a fit memoir of the life and professional services of the deceased.

OF THE BOARD OF DIRECTION.

JANUARY 3D, 1877.—A stated meeting was held at 3 o'clock P. M.; proposals for admission to the Society were considered and other business done.

* A second ballot for applicants to membership and on the appointment of a committee to report to the Society a form of memorial to Congress in furtherance of "adoption of the Metric Standards," (Vol. II, page 173,) was subsequently sent, to non-voting Members.

NOTES AND MEMORANDA.

SELECTIONS FROM CORRESPONDENCE.

THE METRIC SYSTEM OF WEIGHTS AND MEASURES.—The following selections from letters received since the resolution submitted for letter ballot, December 6th, "to further, by all legitimate means, the adoption of the Metric Standards in the office of Weights and Measures at Washington," and to "appoint a committee to report to the Society a form of memorial to Congress in furtherance" of this object, was issued.*

MR. AMORY COFFIN writes: In recording my vote against the resolution looking to the appointment of a committee from the Society for the furtherance of the adoption of the metric system, I would ask permission to state reasons why I take such a stand.

In the first place, I think that such legislation would be an arbitrary measure that is foreign to the nature of the American system of government, for "Liberty in things innocent is the birthright of the citizen." Congress has already authorized and legalized its use, and any one choosing to do so, is at perfect liberty to employ the metric system. Further legislation than this would be, in my opinion, undesirable and mischievous.

In the second place, I believe the system itself to be adapted rather to the uses of the scholar and closet theorist than to the practical uses of the shop and the market. The decimal system has been forced upon our currency, but the quotations of Wall street are made in eighths and quarters, and *not* in tenths. The ordinary human mind refuses to think decimally and requires a base that is capable of binary and ternary division.

My third reason is, that the metre is an extremely inconvenient unit in practice. On paper, for purposes of calculation, it is very convenient, but in the field and in the shop it is not adapted to the many and varied wants of practice. It is too inelastic, too rigid, a system. Sometimes eighths, sometimes twelfths or sixteenths are wanted, and to be forced to use the one measure of tenths in all cases would work great practical inconvenience and mischief.

For these reasons, I sincerely trust that the Society will not commit itself to the adoption of the system.

MR. THEODORE COOPER writes: I most decidedly object to any further legislation upon the subject. It is now permissible, and those who desire can employ it. To make it compulsory would be impossible (it has been in France to a certain extent), unjust, and criminal, in so far as it would be a wanton waste of accumulated capital far exceeding in value the amount of our public debt. It looks very pretty on paper. Only decimal fractions hereafter; away with vulgar fractions (a strong emphasis on the vulgar)! Now, for what purpose this change—because it is more natural or more scientific? It certainly is not the former, for the average mind cannot conceive tenths. There is no example, I believe, on record of any people adopting any such division voluntarily. Halves, thirds, and their combinations are the natural divisions in all the walks of life. The broker counts in eighths, not in mills; the ladies divide the yard into eighths; the mechanic naturally falls into halves, quarters, eighths, &c., down to sixty-fourths, for having conceived one of these steps, he can advance by subdividing his conception by two.

It is no more scientific, for the standards are similarly "pieces of metal"—one located in Paris, the other in Washington. One is supposed to be a fraction of a certain arc of a meridian, and the other a fraction of the seconds pendulum at a certain locality—neither, probably, what they ought to be; but the real standards, as determined by law, are the pieces of metal aforesaid.

Our foot can be used for all the purposes which the metre can, for we can count it in tens, hundreds, and thousands, or in tenths, hundredths, &c.,—similarly for square and cubic feet. As for the beautiful nomenclature which may be part of the attraction, why not request a committee of Greek professors to get up one, for the use of those who may desire it?

The only other argument I can see in favor of the metre is, that some other nations are adopting it. Now, do the gentlemen who advocate this measure consider that of the millions of people in the United States, but a small percentage are interested or affected by the kind of standard used in other countries? Yet they desire the government to compel

* Vol. II., page 173.

every man, woman, and child in the United States not only to lay aside their measures of length, width, and contents—thus wiping out of existence millions of dollars' worth of property—but also that capital which cannot be estimated, the accumulated experience of years based upon our present standards. It would be a more onerous tax than has ever before been inflicted upon a people, and a more unreasonable one.

Let those who wish, use the metric system, but do not let the Society make itself ridiculous by advocating any such compulsion. If it has advantages, let the law of national selection test its merits.

AMERICAN TUNNELING.—In Proceedings for March* it was announced that Mr. Henry S. Drinker, Mining Engineer, was engaged in preparing a general treatise on this subject, and engineers throughout the country were asked to assist in collecting data and facts relating to tunnel construction.

Referring to the work in hand, Mr. Drinker writes (December 22d last):

To answer fully inquiries concerning the progress of my Treatise on Tunneling, I must refer to the date of the first announcement of the work, which it will be perhaps remembered was during last spring; this announcement was made in order that, in addition to the material previously quietly collected and compiled, I might also have the advantage of general returns on the subject from engineers through the country at large, who might be interested in getting out a full report on American tunneling.

Owing to the immediate support and endorsement the work received through the kindly notices of the "Railroad Gazette," "Engineering and Mining Journal," "Railway World," and other technical periodicals, the project became pretty widely known to engineers through the country, and I was encouraged by the immediate receipt of many

very valuable returns; others have been coming in continually during the past summer and autumn, literally from all parts of the world, as only a few days since I received, through the kindness of one of the Members of your Society, a complete and most interesting report on the tunnels of New Zealand, especially prepared for my work by a friend of his in charge out there. Returns are also expected from India and Australia; others from Chili, Peru, and Brazil are at hand; the two latter as yet in an incomplete condition.

The returns from the United States, as I said above, have been very full, but my friends of the profession who have been so kind in giving their aid and assistance in the collection of data, must now bear with me in patience, long enough to allow of this large mass of material being properly and systematically arranged and presented. There are a thousand difficulties in getting out a work like this that a man never thinks of until he has to meet them; one of my most serious obstacles has been the fact that, owing to the large number of illustrations of timber and mason work, lithographic plates, etc., necessary—and the expense of publication, was therefore found to be very heavy.

The translations that will be combined with the work have been carefully selected from Rziha's "Lehrbuch der Gesammten Tunnelbaukunst," Shoen's "Tunnelbau," Lorenz's "Tunnelbau," Pressel and Kaufmann's "Bau des Hauenstein tonnels," the records of the Corps des Pons et Chaussées, and other German and French works. They are now nearly finished, and were already partially done last spring, at the time when I hoped to bring out a first volume in advance of the balance of the work, but was stopped by the increased expense such a course would have necessitated. I am now writing, tabulating, and finishing as fast as possible, and hope to be able, before long, to say that the end has been reached.

* Vol. II., page 45.

LIST OF NEW BOOKS ON ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Art, a Plea for — in the House, with special reference to the Economy of cultivating Works of Art and the Importance of Taste in Education and Morals. W. J. Loftie, London. 12mo. Macmillan, (New York.) 2s. 6d.

Astronomical Lectures. No. 5. Measurement of the Sun's Distance. John Harris. London. 8vo. Trubner. 2s.
Beetle. Potato Pests, being an illustrated Account of the Colorado Potato Beetle, and the other Insect Foes of the Potato in North

- America; with Suggestions for their Repression and Methods for their Destruction. Charles V. Riley. New York. 12mo, illus. Judd. \$0.75.
- Birds, the Land and Game — of New England; with Descriptions of the Birds, their Nests and Eggs, their Habits and Notes. H. D. Minot. Salem. 8vo, illus. (Boston, Estes & Lauriat.) \$3.00.
- Boiler Explosions, Return of Committee. (Parliamentary Report.) London. 8vo. 6d.
- Botany. New Illustrated Plant Record. Alphonso Wood. New York. 8vo. Barnes. \$1.00.
- Chemistry. The Science Examiner. Inorganic Chemistry. J. Mouckman. Leeds. 12mo. (Simpkin, London.) 4d.
- An elementary Treatise on practical and qualitative inorganic Analysis. Frank Clowes. London. 12mo. (Lindsay & Blackiston, Philadelphia. Announcement.)
- Coal, spontaneous Combustion of —. (Parliamentary) Report and Evidence. London. 8vo. 3s.
- Drawing from Nature; a Series of progressive Instructions in Sketching; to which are appended Lectures on Art; delivered at Rugby School. George Barnard. New ed. London. 8vo, illus. Routledge. 21s.
- Education. Report of the Commissioner of — for 1875. Washington. 8vo. Gov. Printing Office.
- Encyclopædia Britannica, a Dictionary of Arts, Sciences, and general Literature. Ninth ed. Vol. V. Edinburgh. 4to, illus. (Little, Brown & Co., Boston.) \$9.00.
- of Universal Information (the globe). Ed. by John M. Koss. Vol. 2. Edinburgh. 4to, illus. Jack. (London. Simpkin.) 12s. 6d.
- Fire Surveys, a Summary of the Principles to be observed in Estimating the Risk of Buildings. E. M. Shaw. 2d ed. London. 12mo. Wilson. 5s.
- Friction, a Treatise on the Theory of —. John H. Jellett. Dublin. 8vo. (Simpkin, London.) 8s. 6d.
- Fungi, a plain and easy Account of British — with special Reference to the esculent and economic Species. M. C. Cooke. 3d ed. rev. London. 12mo. illus. Hardwicke. 6s.
- Mushrooms and Toadstools: how to distinguish easily the Differences between edible and poisonous Fungi. G. Worthington Smith. 3rd ed. London. 12mo. illus. Hardwicke. 1s.
- Geometry, involutional —: a Series of Problems, intended to familiarize the Pupil with geometrical Conceptions, and to exercise his inventive Faculty. William George Spencer, with a prefatory Note by Herbert Spencer. London. 18mo. (Appleton, New York) \$0.50.
- Simon's Euclid, ed. in the symbolical Form, by R. Blacklock. New ed. London. 18mo. Simpkin. 6s.
- Geological Observations on the volcanic Islands and Parts of South America visited during the Voyage of H. M. S. "Beagle." Charles Darwin. 2nd ed. London. 8vo, illus. Murray. 12s. 6d.
- Geology. The great ice Age and its Relation to the Antiquity of man. James Geikie. 2nd ed. rev. London. 8vo, illus. Daldy & Isister. 24s.
- What the Earth is Composed of? 3 Lectures by Prof. Roscoe. London. 12mo, illus. Macmillan (New York). \$0.25.
- Gold; or, legal Regulations for the Standard of Gold and Silver Wares in different Countries of the World. Trans. and abr. from "Die gesetzliche Regelung des Feingehaltes von Gold und Silber Waaren, von Arthur von Studnitz," by Mrs. Brewer; with Notes and Additions by Edwin W. Streeter. London. 8vo. Chatto & Windus. 3s. 6d.
- and Debt, an American Handbook of Finance, with over 80 Tables and Diagrams illustrative of the following Subjects: the Dollar and other Units; Paper Money in the United States and Europe; Gold and Silver in the United States and Europe; Suspensions of Specie Payments; the Era of Gold; Values of the Precious Metals; the Era of Debt; the Rise and Fall of Prices; also a Digest of the monetary Laws of the United States. W. L. Fawcett. Philadelphia. 12mo. Griggs. \$1.75.
- Health, Relation between topographical Surveys and the Study of the public Health. James T. Gardner. Albany. 8vo.
- Insurance, Notes on Life —. Part I, theoretical, Part II, practical; with Appendix and algebraic Discussion. Gustavus W. Smith. 3d ed., rev., enl. and re-arranged. New York. 8vo. Van Nostrand. \$2.00.
- Iron and Metal Trades Companion; being a Calculator containing a Series of Tables upon a new and comprehensive Plan for expeditiously ascertaining the Value of any Goods bought or sold by Weight, from 1s. per Cwt. to 112s. per Cwt., and from 1d. per Pound to 1s. per Pound; each Table extends from 1 Pound to 160 Tons; to which is appended Rules for Decimals, Square and Cube Roots, Mensuration of Superficies and Solids, &c.; also Tables of Weights of Materials, and other useful Memoranda. Thomas Downie. London. 16mo. Lockwood. 3s.
- a Treatise on the Application of —, to the Construction of Bridges, Girders, and other Works. Francis Campin. 2nd ed., rev. and cor. London. 12mo. (Weale's Series.) Lockwood. 2s. 6d.
- Light, the Japan — with which the Japanese Government has provided the leading Ports. R. H. Brenton, with Abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. Inst. Civil Eng.
- Mechanics, the operative — Workshop Companion. William Templeton. 12th ed., rev. and enl. London. 18mo. Lockwood. 5s.
- Metal Trade; Calculator for —. Gavin Wilson. London. Knight. 10s. 6d.
- Natural History and Antiquities of Selborne. Gilbert White; rev. by James Edmund Harting. 2nd ed., with 10 Letters not included in any previous Ed. London. 8vo. Bickers. 10s. 6d.
- Mining, Transactions of the North of England Institute of mining and mechanical Engineers, September and October. Newcastle-on-Tyne. 8vo.
- Orthographic Projection, elementary Treatise on —. William Binns. 8th ed., illus. Vol. I. London. 8vo. Spens. (New York.) 9s.
- Parks, Third annual Report of the Board of Commissioners of the Department of Public Parks, New York, from May 1st, 1872, to December 31st, 1873. New York. 8vo.
- Plains of the Great West and their Inhabitants, being a Description of the Plains, Game, Indians, etc., of the Great North American Desert. Richard Irving Dodge; with an Introduction by William Black

- more. New York. 8vo, illus. *Putnam's*. \$4.00.
- Problems, Solutions of the Cambridge Senate House Problems and Riders for 1875. A. G. Greenhill. London. 8vo. *Macmillan* (New York). 8s. 6d.
- Projection, the Art of —, a Manual of Experimentation in Physics, Chemistry, and Natural History, with Porte Lumière and Magic Lantern. A. E. Dolbear. Boston. 12mo, illus. *Lee & Shepard*. \$1.50.
- Rail joints (on). Extracted from the "Engineer" November 10th and 17th, 1876. C. P. Sandberg. London, folio, illus. *Engineer*.
- Railways. (Parliamentary Reports.) London. 8vo. Inspectors' Reports on Accidents. Part 5. 2s. 6d. Returns of Accidents, April to June, 1876. 1s. 2d.
- , On the permanent Way of —. R. P. Williams, with Abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers). London. 8vo, illus. *Inst. Civil Eng.*
- Rivers Pollution Prevention Act, 1876, 39 and 40 Vic., c. 75; with Introduction, Notes and Index. Alexander Glen. London. 12mo. *Knight*. 2s. 6d.
- Sanitary Measures, East India—1874-75. Papers. (Parliamentary Reports.) London. 8vo. 2s. 2d.
- Science. Roger Bacon; the Philosophy of Science in the Middle Ages: an Address, introductory to the Session 1876-7, in the Department of Art, Science and Law, at Queen's College, Manchester. pp. 36. Robert Adamson. Manchester. 12mo. (*Simpkin, London*). 1s.
- Ships, the Fleets of the World; the Galley Period. Foxhall A. Parker. New York. 8vo, illus. *Van Nostrand*. \$5.00.
- Sorrento and inlaid Work, a Manual of —, for Amateurs, with original Designs. Chicago. 8vo, illus. (*Am. News Co., New York*). \$1.50.
- Steam Engines, the relative Merits of simple and compound Engines as applied to Ships of War, with an Appendix containing Particulars and Analyses of recent Experiments. Neil McDougall. London. 8vo. *Spon's* (New York). \$1.75.
- Survey. Report of the trigonometrical Survey of the Island of Hokkaido (Japan) for 1876. M. S. Day. New York. 4to, illus. *Hart*.
- Trade and Navigation Accounts for October. (Parliamentary Report). London. 8vo. 5d.
- Transportation Route along the Wisconsin and Fox Rivers in the State of Wisconsin, between the Mississippi River and Lake Michigan. Report on —. Gouverneur K. Warren. —. Washington. 8vo. *Gov. Printing Office*.
- War, Franco-German —, 1870-71. First Part: History of the War, to the Downfall of the Empire. Second Volume (Sections 6 to 9): from the Battle of Gravelotte to the Downfall of the Empire, with case of Maps and Plans. Trans. from German official Account, by F. C. H. Clarke. London. 8vo. 22s.
- Water Companies. Metropolitan—Account for 1875. (Parliamentary Report.) London. 8vo. 5d.
- Wood Conversion by Machinery. John Richards. London. 8vo, illus. *Spon's* (New York). \$1.50.
- Worsted Pieces; Holdsworth's ready Reckoner for Hanks in worsted Pieces, being Tables giving the net Yarn in Hanks required in Pieces from 5 to 50 Picks per quarter Inch, 15 to 80 Inches in Width, and 1 to 100 in Length. Bradford. 8vo. (*Simpkin, London*). 21s.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: *regular* meetings, when ballots for members will be canvassed, and other business done, Wednesday, February 7th, March 7th, and April 4th; and *stated* meetings, for consideration of professional topics and enjoyment of social intercourse, Wednesday, February 21st, March 21st, and April 18th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term for the transaction of regular business, will be held February 7th, March 7th, and April 4th, at 3 o'clock P. M.

At the next *regular* meeting of the Society (February 7th), ballots for members, and upon the appointment of a Committee to report to the Society a form of Memorial to Congress in furtherance of the adoption of metric standards, will be canvassed. A paper by Henry F. Walling, C. E., of Boston, Mass., on "Co-Ordinate Surveying," will be presented. "Some Facts and Opinions relating to Failure of the Railway Bridge at Ashtabula,

Ohio," will be considered, and other business done.

A General (Quarterly) Meeting of the AMERICAN INSTITUTE OF MINING ENGINEERS will be held in New York, beginning Tuesday, Feb. 27th next, at 8 o'clock P. M. The first, and probably other sessions, will be at the rooms of the Society. It is proposed to have a joint meeting of the two associations before the final adjournment; announcement of the order of arrangements will be made in due time.

RATES OF POSTAGE on transient matter sent to the Society from domestic post-offices, except New York, are as follows:

On books, pamphlets, periodicals, maps and corrected proof sheets, *one cent per two ounces*; on photographs, lithographs, and engravings, *one cent per ounce*; and on letters and other mail matter, either wholly or partly in writing (except corrected proofs), sealed packages, or those wrapped so as not to be conveniently examined without destroy-

ing the wrapper, *three cents per half ounce*. The sender may write or print his address in or on a package, and state names and number of articles enclosed, without extra charge.

Matter upon which not enough postage is prepaid, is charged on delivery with *once or twice* the deficiency, according to class; and it is not infrequent that from \$0.50 to \$5.00 is thus charged.

The attention of members is called to these conditions. Generally, it is better to forward a package by express when the postage thereon exceeds \$0.35, or the rating is uncertain.

PAPERS HAVE BEEN RECEIVED for presentation to the Society, since the last announcement, as follows:

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TITLE PAGE AND LIST OF CONTENTS of Volume V. Transactions are issued herewith; a topical Index of Volume I, Proceedings, will be published in February Journal, there not having been time for its preparation earlier.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election.
BATTERSON, JAMES G. [F.] Hartford, Conn.....	June 7, 1876.
MENDELL, GEORGE H.....Maj. of Engs., U. S. A.....	Sept. 6, "

CHANGES AND CORRECTIONS.

BECKWITH, ARTHUR.....	Room 54, Coal and Iron Exchange, Cortlandt and Church streets, New York.
BECKWITH, LEONARD F....	Prest. Fire Proof Building Co. of New York, Room 54, Coal and Iron Exchange, Cortlandt and Church streets, New York.
BILLIN, CHARLES E.....	Box 2580, Philadelphia, Pa.
BOUSCAREN, L. G. F.....	Cons. Eng. Cincinnati Southern R'y, Cincinnati, O.
BROOKS, THOMAS B.....	Monroe, N. Y.
CORTHELL, ELMER L.....	South Pass Jetty Co., 122 Common street, New Orleans, La.
DARRACH, CHARLES G.....	3906 Woodlawn street, W. Philadelphia, Pa.
DOANE, EDWIN A.....	Myrth Block, East Fifth and Utica streets, Oswego, N. Y.
FORD, ARTHUR L.....	80 West Sixth street, Oswego, N. Y.
KENNEDY, JAMES C.....	Care William Kennedy & Sons, Owen Sound, Ontario, Canada.
PETERSON, PETER A.....	Ch'f Eng. Q. M. O. & O. R'y, Montreal, Canada.
POST, ANDREW J.....	136 Magnolia ave., Jersey City Heights, N. J.
SEDGWICK, THOMAS S.....	732 Twenty-first street, N. W., Washington, D. C.
STAATS, ROBERT P.....	349 West Fourteenth street, New York.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. February, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 17TH, 1877.—A stated meeting was held at 8 o'clock P. M.

Communications* from Messrs. Charles W. Copeland and Francis Collingwood, giving account of the "Mount Washington Railway, (N. H.), its construction and operation," were read and discussed. A photograph of a portion of the railway, showing the center rail and the style of locomotive engine used, was exhibited.

It was announced that the American Institute of Mining Engineers would hold a general (quarterly) meeting in this city, beginning Tuesday, February 27th, next,† and the Institute was invited to meet at the rooms of the Society.

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Mr. Charles Macdonald, who had examined the wreck, soon after its failure, described the plan of the bridge, and its appearance after the disaster; a general discussion followed.

FEBRUARY 7TH, 1877.—A regular meeting was held at 8 o'clock P. M.

The vote on admission to membership was canvassed and the following declared elected:—Members—Frederick S. Benson of Brooklyn, N. Y.; Eckley B. Coxe of Drifton, Pa.; William C. Gunnell of Hartford, Conn., and David E. McComb of Washington, D. C.; and Junior, Sanford Horton of New York.

At the same time, the vote ordered December 6th, 1876 ‡ (under resolution presented at the Eighth Annual Convention §), upon appointment of a Committee to report to the Society, a form of Memorial to Congress in furtherance of the adoption of a metric standard, was canvassed, with the following result—ayes 138, nays 73, and blank 20.

* See page 12. † See page 18. ‡ Vol. II, page 173. § Vol. II, page 85.

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* See page 12. † See page 18. ‡ Vol. II, page 173. § Vol. II, page 85.

A paper by Henry F. Walling, C. E., of Boston, Mass., on "Co-ordinate Surveying" was read; also—as relating to the same subject—extracts from a recent report upon the "New York State Survey."

Attention was called to the next meeting of the American Institute of Mining Engineers; the first session to be held at the Society's Rooms Tuesday evening, February 27th; a session also to be held Wednesday evening following, when an informal discussion will be had on the "advisability and practicability of adopting, in this country, the metric system of weights and measures"; members were invited to attend.

"Facts and Opinions, in regard to Failure of the Railway Bridge at Ashtabula, Ohio," were taken up. Communications from Messrs. G. K. Warren, E. N. Beebout and E. S. Philbrick, were read, and the subject was further discussed by Messrs. William P. Shinn, George S. Morison, and others present.

OF THE BOARD OF DIRECTION.

FEBRUARY 7TH, 1877.—A stated meeting was held at 3 o'clock P. M.

The manner of keeping the accounts of the Society and appropriating its funds, was considered and a plan adopted; the stated meetings were placed under the direction of the President, Secretary and Committee on Library, to arrange papers, reports and other subjects for consideration, the order of business and to give special invitations to attend; recommendations from the Committee on Library, regarding copyright, and title of the Society's monthly publications and the publication of reports, were presented and acted on; the Treasurer's report of receipts and expenditures for quarter ending January 31st, was accepted, appropriations were made, and other business transacted.

FEBRUARY 9TH, 1877.—An adjourned meeting was held at 10 o'clock A. M. Proposals for admission to membership were considered.

REPORT OF COMMITTEE

ON FINANCE, FOR YEAR ENDING OCT. 31ST, 1876.

ACCEPTED JANUARY 3D, 1877.

We have carefully examined the Treasurer's accounts of receipts and expenditures, and compared them with entries and vouchers, and find them correct. We have also examined the securities of the Society in the hands of the Treasurer, deposited for safety in the vault of the Central Safe Deposit Company, (corner of Twenty-third street and Sixth avenue). These securities are as follows:

1 Bank-book, Seaman's Savings	
Bank for Savings (balance*)	\$764 17
1 \$1 000 bond, Norman Medal Fund	1 000 00
8 \$1 000 bonds, Fellowship Fund...	8 000 00
1 \$500 bond, " "	500 00
Making a total † of.....	
	\$10 264 17

* July 1st, 1876. † See detail report of sub-committee.

Some modification of the system of disbursing the Society's funds seems desirable. It has been suggested that at intervals through the year, the Finance Committee, after ascertaining the balance at the time on hand, should designate the amounts applicable to the ordinary expenses and the sum that could be devoted to increase of the Library, etc.; but, on account of the irregularity in the periods and amounts of the payments from members, etc., this is not as feasible as it might at first view appear to be. Thus, during November and December, 1875, and January, 1876, \$4 613.46, or about 45 per cent. of the total for the year, were received. In the month of October, 1875, only \$295 came in; while in the next month, November, \$1 921.10 were received; whereas in November, 1876, only \$412.50 were received (or \$1,500 less than in the same month of 1875), while in the first 20 days of December, 1876, the receipts were \$2 437.43. The mere fact of a *balance* in the treasury at any given date, will not of itself, afford sufficient data upon which to base the disposition of the several expenditures; an analysis of the items of receipts and expenditures will be necessary to determine how much might fairly be appropriated for expenses, beyond the ordinary annual expenditures.

In 1876, the leading items of expenses were:

Secretary and clerks.....	\$3 000 00
Transactions.....	2 613 00
Rent, fuel and light.....	1 884 00
Stationery and printing.....	\$537
Postage.....	260
	<hr/> 797 00
Reporting Proceedings.....	369 00
Total.....	<hr/> \$8 663 00

These cover about 95 per cent. of all expenses for the fiscal year ending October 31st, 1876.

The leading receipts for the same year came from the following sources:

Entrance fees.....	\$1 670 00
Members' annual dues.....	7 014 00
Annual interest of funds.....	630 00
Advertisements.....	597 00
	<hr/> \$9 911 00

The total amount received was \$10 433.39 (including balance, \$281.75, at end of the previous year, and \$150 Fellowship subscription).

At the end of the fiscal year of 1876, there was an apparent balance of \$1 274.77; but a few days after the close of the fiscal year, a number of bills which had to be paid, amounting to some hundreds of dollars, came in.

It may be, we think, safely assumed, that the receipts for the present fiscal year will at least equal those of last year; so that if the receipts should be, in round numbers \$10 000, and the usual expenses, say \$9 000, there would be between \$1 500 and \$2 000 (including the actual available balance from 1876), applicable to the Library, or such other purposes as the Society might deem proper.

It may be worth considering, whether or not it is advisable to create and maintain a *reserve fund*, to aid in securing more commodious, permanent quarters.

For convenient reference, we have summed up the receipts in 1876, during each month, as follows:

November, 1875*	\$1 921 10
December, "	1 234 37
January, 1876.....	1 457 99
February, "	725 80
March, "	690 55
April, "	799 57
May, "	490 08
June, "	547 50
July, "	567 10
August, "	1 107 50
September, "	596 88
October, "	295 00
Total, 1876	<hr/> \$10 433 39

In the spring the balance on hand is heaviest, as the monthly expenditures are more equally divided throughout the year than are the monthly receipts.

With the foregoing statement before them, the Board of Direction can judge (as well as can the Library and Finance Committees) approximately, respecting the disposition of the Society's funds for the present fiscal year. An *average* of about \$760 per month was expended during the fiscal year of 1876.

We regard it as a fitting time to establish a system, which can be conveniently carried out, regulating appropriations to be made by the Board of Direction.

W. MILNOR ROBERTS. } Members
W. H. PAINE, } Finance Com.

* Including \$281.75 balance from preceding year.

STATEMENT OF THE FINANCES OF THE SOCIETY,

PREPARED FROM THE TREASURER'S REPORTS.*

RECEIPTS, 1875-6.

Past Dues from 7 resident Members.....	\$295 00	
" 17 non-resident "	325 00	
" 1 " Associate	10 00	
		\$630 00
Current Dues from 79 resident Members.....	\$1 975 00	
" 3 " Associates.....		} 3 660 00
" 8 " Juniors.....		
" 233 non-resident Members..		
" 11 " Associates.....		} 410 00
" 30 " Juniors.....		
" 1 " Member, balance	10 55	
" 1 resident Associate, "	5 00	
		\$6 060 55
Half Dues from 3 resident Members.....	37 50	
" 3 " Juniors.....	20 00	
" 24 non-resident Members.....	180 00	
" 9 " Juniors.....	45 00	
		282 50
Additional Dues from 2 Associates and 2 Juniors, who became Members.....		20 00
Dues for 1876-7 from 1 non-resident Member.		15 00
Sundry overpayments of Dues.....		7 09
Entrance Fees from 43 Members.....	1 290 00	
" 1 Associate.....		} 380 00
" 18 Juniors.....		
		1 670 00
" 1 Fellow.....		150 00
		8 835 14
Fellowship Fund. Interest on 8 Jersey City Water Loan Bonds, for year ending July 1st, 1876.....		560 00
Norman Medal Fund. Interest on New York City Croton Aqueduct Bond, for year ending November 1st, 1875.....		70 00
		630 00
Advertisements in Journal	597 00	
Publications.....	76 00	
Diplomas.....	13 60	
		686 50
Treasurer's Receipts for year ending October 31st, 1876.....		\$10 151 64
" Balance, November 1st, 1875.....	\$275 63	
" " of Fellowship Fund	6 12	
		281 75
Total.....		\$10 433 39

* Under direction of the Committee on Finance, in compliance with resolution adopted at meeting of the Society, January 3d. Approved by the Board of Direction, February 7th.

PAYMENTS, 1875-6.

Publications. Printing Journal of the Society.	\$2 322 25	
Engraving.....	265 50	
Copyright.....	5 00	
		\$2 592 75
Extra Papers.....		21 00
List of Members.....		94 75
		\$2 708 50
Reporting at Seventh and Eighth Annual Con- ventions.....		415 78
Stationary. Ballot Lists.....	\$30 50	
Circulars.....	85 25	
Forms of Application, Bills, Cards, &c.....	30 25	
Notices of Meetings and other Notices.....	47 25	
		\$193 25
Blank Books, Envelopes, Paper, &c.....		225 42
		418 67
Postage.....		280 61
Library. Books, Binding and Cards.....		62 45
Rooms. Rent.....	\$1 600 00	
Heating.....	100 00	
Gas.....	16 45	
Janitor.....	168 00	
Ice.....	4 28	
		1 888 73
Furnishing.....		98 82
Insurance.....		54 01
Secretary and Clerks.....		3 800 00
Norman Medal, Engraving and Case.....		74 65
Safe Deposit, Rent.....		12 00
Hand Stamps for Treasurer.....		5 50
Expressage and Sundries.....		88 90
Miscellaneous.....		5 00
		\$9 093 62
In Secretary's hands for Office Expenses.....		65 00
Treasurer's Payments for year ending October 31st, 1876.....		\$9 158 62
" Balance, November 1st, 1876.....		1 274 77

ASSETS AND RESOURCES, NOVEMBER 1st, 1876.

Furniture, Library and Transactions on hand, (Secretary's estimate).	\$9 000 00	
McAlpine Library (insured for)	2 000 00	
		\$11 000 00
Fellowship Fund: 8 Jersey City Water Loan (7%) Bonds, par value \$8 000—cost.....	\$8 250 00	
Accrued Interest, from July 1st.....	186 67	
1 U. S. Registered (5-20, 6% gold) Bond, par value \$500—cost.....	579 88	
Accrued Interest from November 1st, 1875, \$30 Gold—say.....	31 50	
		\$ 9 047 55

Brought over.....		\$9 047 55	\$11 000 00
Norman Medal Fund : 1 New York Croton Aqueduct			
(7%) Bond.....	\$1 060 00		
Accrued Interest from May 1st,			
1876.....	35 00		
		1 035 00	
Deposit in Seaman's Savings Bank for Savings, (January			
1st, 1877.....		821 28	
New York Central Railroad Stock : 5 shares—cost.....		536 25	
Treasurer's Balance, November 1st, 1876.....	\$1 274 77		
In Secretary's hands for office expenses.....	65 00		
		1 339 77	
Members' past dues.....		\$2 945 00	\$12 779 85
“ current dues (payable to November 1st).....		8 115 00	
			\$11 060 00
Total.....			\$34 839 85

The value of dies for the Norman Medal, and dividends on the New York Central Railroad stock accrued, since April 2d, 1868, are not included.

RECEIPTS AND PAYMENTS FOR QUARTER ENDING JANUARY 31st, 1877.

	RECEIPTS.	PAYMENTS.	
In November.....	\$412 50	\$1 131 48	
“ December.....	2 453 24	634 91	
“ January.....	1 602 62	262 00	
	\$4 468 36	\$2 028 39	
Excess of Receipts.....			\$2 439 97
Balance at Beginning of Quarter.....			1 274 97
Balance at end of Quarter.....			\$3 714 94

NOTES AND MEMORANDA.

SELECTIONS FROM CORRESPONDENCE.

MOUNT WASHINGTON RAILWAY.—During the past season, the Secretary, at request of foreign engineers, sought information in regard to the construction and operation of this railway.

MR. CHARLES W. COPELAND wrote: The length of this railway is about 3 miles; the total rise from the lower station to Mount Washington House, on the summit is 3 625 feet; and the steepest grade is 1 980 feet to the mile, about 1 in 3, but averaging through the entire course, 1 in 4.

The road bed is constructed with special reference to safety and durability, of heavy timber, clamped to the rocks of the mountain slope, and braced and secured in the strongest manner.

The track is of the usual gauge, with side rails of the usual pattern, and a central safety rail, constructed of two parallel bars of angle iron,

with cross bolts of 1½ inch-round iron, at intervals of about 4 inches; between these bolts play the cogs of a central wheel of the locomotive.

In addition to ordinary brakes, the atmospheric brakes, instantaneous in their action, are in use, and, following and dropping into the notch rim of the driving-wheel, is a firm iron support which would effectually prevent the descent of a train in case of injury to the machinery. Rollers under the angle iron prevent jumping or slipping from the track.

With these arrangements for safety, the passenger need feel no alarm or apprehension of danger, the trip being as safe as ordinary rail transit, no accident having occurred in the seven years the road has been in operation, nor damage of a penny to life, limb, or material, during the time of construction, or since its operation as a line of travel.

The locomotive is of novel construction, being made with special reference to the steep inclination of the road, and when standing upon the level track, appears sadly out of balance. Safety and power are attained in the construction, at the expense of speed which is not sought. The locomotive is always below the train, pushing the coach upward as it ascends, and preceding it in the return down the slope. The cars have seats hung at an angle, facing toward the base.

Mr. Copeland also submits these notes ;

The road was built at first with strap rails, but as they were continually breaking, they were taken up, and a T rail weighing 30 pounds to the yard, put down instead. The centre or cog rail is made of 3 inch-angle iron, with pins made of the best Pembroke iron, 4 inches long, $1\frac{1}{4}$ inches in diameter, and 4 inches apart, riveted between them. This cog rail is nothing but an iron ladder bolted to the road bed, into which a gear wheel on the driving axle of the engine works; the cog rail weighs 66 pounds to the yard.

The road was about 8 miles long, but this spring, it was extended down $\frac{1}{2}$ mile more to connect with Boston, Concord & Maine R. R., which now runs to the base of the mountains. There are some pretty sharp curves on it; I forget the degree of curvature, at all events we run about as short curves as on ordinary roads. There is no switching apparatus as none can be used with centre cog rail, but there are turn-tables.

The original engines had only one pair of cylinders 10×16 inches, and all the power was applied to one axle, but this has been improved by using 4 cylinders $8 \times 1\frac{1}{2}$ inches, and dividing the power between the two driving axles. The crank shaft on the engine is geared to the driving axle in a ratio that the piston makes $5\frac{1}{4}$ strokes to 1 of the driving axle.

Air is used in the cylinders when the train is coming down; gravity tends to force the train down hill, moves the pistons, and the engineer lets the air out of the cylinders as fast as he wants to run; there are other brakes besides.

The engine backs down the hill with the car above it. At first, upright boilers were used, but these have been abandoned for horizontal ones, set at an angle that will be level on an average grade. The engines weigh about 12 tons, the cars seat about 50 persons, and weigh about 3 tons. Only one car to an engine is run, but sometimes 80 persons are carried to a car—50 however are enough.

There is not much grading to the road, as the mountain is about all stone. Most of the

low places are spanned by trestle work; that over "Jacob's Ladder" is 27 feet high. The grade varies with the mountain up and down, although the least grade is a rise of 1 in 8.

The original capital was \$110 000, but it took all that to build the road; since, all the earnings of the road have been put into it, in the shape of rolling stock and improvements, till it now has cost over \$200 000. The road is not in debt, but has never paid a dividend.

7 000 passengers were carried last year, at a fare up and back of \$4. There are 5 engines and 5 cars, also 2 platform cars; sometimes not more than 10 passengers are carried in a day, and sometimes 200, depending on the weather. It is only a pleasure road, so freight is not carried, although a large hotel has been built on the summit, all of which was carried up over the road.

The receipts are about \$24 000 per year, half or more of which, it costs to run the road; it is only run for summer travel—say three months in the year.

Cog railroads were first used in England; there is one running into Madison, Indiana, one mile long, with a grade of 500 feet; it has been in operation since 1847, and always been run during summer travel, since the road was opened.

The road up Mount Rigi, Switzerland, was built from this. Engineers were sent over who got leave and made drawings of this road and its engines.

Mr. FRANCIS COLLINGWOOD writes: Having been requested to make such memoranda as he could, respecting the construction and operation of this road, during a recent visit to the White Mountains, the writer would present the following brief and necessarily somewhat imperfect description written from notes made hurriedly on the spot.

The inception of the work was due to Mr. Sylvester Marsh, of Littleton, N. H., who, after much opposition succeeded in building the first road—beginning April, 1866, and completing it in July, 1869. The first track was laid with the outer rails of light, flat iron. The locomotives also were imperfect, the boiler being vertical and filled by the use of a funnel, and having too small a steam space for the service required.

The present superintendent, Mr. Walter Aikin, of Franklin, N. H., has been in charge several years, and has entirely changed the character of the road and rolling stock, so that it is now in efficient working order, and has almost entirely superseded other modes of ascending the mountain.

The road is in two sections, one of $2\frac{1}{4}$ miles length, reaching from Fabyan's (the junction of the "Portland & Ogdensburg"—and the

"Boston, Concord, Montreal & White Mountains" railroads), to "Base Station." This portion has a maximum grade of 296 feet per mile, and is run by traction engines with ordinary cars.

The portion ascending the mountain, and hereafter exclusively considered, has a length of $3\frac{1}{2}$ miles. Its maximum grade (at a point called Jacob's ladder, ending at 1 mile from and 800 feet below the summit), is 1980 feet per mile; its minimum grade is 660 feet, and the average 1300 feet per mile. The vertical curves joining the various grades are quite sharp—but their radii were not learned. There are nine lateral curves, varying from 497 feet to 945 feet radius.

Comparatively little grading was done; low trestling, strongly braced, with bents about 12 feet apart, being used by preference. The Superintendent says, however, that he should change this, were he to reconstruct the road.

Where there is no trestle, heavy cross bearers of timber are bedded against rocks or into the soil, at about 12 feet apart. On these, are bolted longitudinal stringers, 8×12 inches. On these again, are placed sawed cross-ties, originally 4 feet, and since made 2 feet apart. Last of all, are placed a set of longitudinal stringers on top of the cross-ties. The outer ones are 4×7 inches, fastened by bolts reaching through the cross-ties and the lower stringer, every 2 to 4 feet. They support the outer rails, which are light iron rails, 30 pounds to the yard, without fish-plates but with joint-plates. They serve simply to support the car and engine. The middle stringer rests upon and is bolted to the cross-ties. It is 4×8 inches, and supports the central cog-rail. All the bolts, as nearly as could be seen, were screw bolts.

The cog-rail, which is the peculiar feature of this road, weighs 66 pounds, and cost \$6 per yard delivered at the base of the mountain. It is made in 12 feet lengths of two pieces of $3 \times 3 \times \frac{1}{2}$ inch-angle iron, placed 4 inches apart and joined by $1\frac{1}{2}$ inch-diameter round pins, placed 4 inches apart, centre to centre, and firmly riveted to the vertical flanges. The rail is, therefore, $10\frac{1}{2}$ inches wide, and projects $1\frac{1}{2}$ inches on each side beyond the stringer to which it is fastened. The reason for this will be seen hereafter. The lateral flanges were pierced for bolts at every 18 inches of length, but bolts were only used at every 3 feet of each angle iron. The pins are made of best Pembroke iron.

The gauge of the track is 4 feet $7\frac{1}{2}$ inches, owing to a fancy of the projector that he must have a close gauge. The original cost of the

$3\frac{1}{2}$ miles of road, with equipment, was about \$150 000; but this has since been increased by expenditures from earnings, to \$210 000. There are four water tanks at various points, supplied by springs in the vicinity; a turntable and small engine-house on the summit, and some cheap buildings at the base.

Each train consists of an engine and one car. The first locomotives built, having an upright boiler and but two steam cylinders, weighed $6\frac{1}{2}$ tons each. The latest, designed by Mr. Aikin and built in 1875 at the Manchester Locomotive Works, N. H., have 4 cylinders, a rigid wheel base (the length I did not learn), and weigh 12 tons each. They consume $\frac{1}{2}$ cord of wood each, per round trip. The cars measure 8×30 feet, inside measure, seat 50 persons, and weigh 3 tons each. There is no special arrangement of seats, as in the cars used on the Pittsburgh and other inclined railways. The boiler of the latter engine is of the ordinary locomotive type, except that the steam-drum is at the centre of length of the horizontal shell, instead of at one end. The shell is about 9 feet long (diameter I did not get), and inclined to the frame sufficiently to make it horizontal when the engine is on the average grade. On the level, the engine looks as though it had been in collision with another. As stated, each engine has 4 cylinders, 8×12 inches, each pair working on an independent crank shaft, geared respectively into gear-wheels on the forward and rear axles of the engine. The valves are ordinary slide valves, worked from eccentrics on the crank shafts, and cutting off at three-fourths stroke.

In addition to the steam and exhaust pipes, an air supply pipe is carried from each valve-chest into the cab, and provided with suitable cocks under the control of the engineer. He is by this means enabled, in going down hill, to shut off steam entirely, and run the train down against the air-pressure in the cylinders, the amount of compression being under perfect control. While thus working and discharging compressed air, the condensation of moisture caused by the rapid expansion of the jet, gives it every appearance of a discharge of steam. After many experiments, Mr. Aikin arrived at the following combination of gears: The pins in the rail, Pembroke iron; the central cog-wheels (one on each axle of the engine, and one on the upper axle of the cars), of best chilled car-wheel iron, 26 inches exterior diameter. At the roots of the teeth, the wheel is 4 inches thick, and at the ends, $3\frac{1}{2}$ inches; this allows for lateral play, curves, &c.

The gear wheels (two on each engine axle, and two on the upper car axle) are 33 inches exterior diameter and 4 inches thick, and made of gun metal. The pinions, two on each crank shaft on both car and engine, of 6 inch diameter, are made of steel. This gives about 5½ revolutions of the engine to 1 of the driving wheels. The speed of ascent and descent of trains is about 2 miles an hour, or at the rate of an easy walk. The engine is always *below* the car, and entirely free from it, the bumpers simply coming in contact. The water-tank and wood-box are on the lower end of the engine, over the lower axle. The baggage crate, a simple platform, runs below all, and is attached to the engine by chains.

The means of stopping the engine are, *first*, a ratchet and pawl. The ratchet is about 2 inches in diameter and 5 inches face; it is placed on the upper axle; and the pawl is always playing as the train *ascends*. On going down hill the pawl is held up, but can be instantly dropped by the engineer. In addition to this, are powerful strap brakes on each axle.

For stopping the cars there are—*first*, a ratchet and pawl on the upper axle; *second*, a strap brake on the lower axle, or as in some recent cars, 2 shoe-brakes at each wheel; *third*, an ingenious atmospheric brake, worked by the upper axle of the car, through the gear mentioned and crank axle, corresponding in all respects to those on the engine. One of the brakes is placed on each side of the car, underneath, and consists of a plain cylinder, about 8×12 inches, with piston working in it air-tight, the piston being joined by connecting rod to the corresponding crank on crank shaft. A plain air passage connects the two ends of the shaft, so that the air is pumped alternately from one end to the other. A throttle valve is placed in this passage, which is under control of the brakeman; and he can, by lessening or increasing the opening,

increase or diminish the brake power, at will. As this axle is geared to the central rail, it will be seen that the car is positively held by the brake, and does not depend upon friction.

Mr. Alkin says, they find a great economy to result from a proper *oiling* of the central rail. This they do about once a week, by a can attached to the engine, with a properly adjusted opening.

No views of their most recent engines were obtainable, and the ones exhibited are of the older type. 7000 passengers were carried last year, without an accident, and no passenger has yet been hurt.

A gang of men is kept constantly on the line, and they have a means of descending the line which is both novel and interesting. Each man carries a kind of sled—a flat board, with cross-pieces for the feet and attachments. This slides on the central rail. Near the front end a brake is attached on each side, by a bolt running across the board. The handles of these, reach back to a convenient position for the rider to operate either by lifting or pressing down (according to the style of brake), and the brake takes hold on the under side of the projecting lip of the central rail. It requires large practice to work these safely, but Mr. Alkin says, an experienced rider will descend the length of the line in 4 minutes, and be able to stop anywhere he desires.

Some details of this road are given in the various guide-books, but they refer rather to the line as first laid, than as at present running.

There are many omissions, and no doubt, some inaccuracies, in this communication, which must be charged to the hurried manner in which the notes were taken, without time for revision and subsequent correction.

* A large photograph of the railway and a train, showing clearly the arrangement of track and centre rail, may be seen at the Society's rooms.

LIST OF NEW BOOKS ON ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Animals, the Uses of—, in Relation to the Industry of Man, a Course of Lectures. E. Lankester. London. 12mo. *Hardwick & Bogue*. 4s.

Archæology of Rome. The Aqueducts, traced from their Sources to their Mouths. John H. Parker. London. 8vo, illus. *Murray*. 15s.

— Discoveries at Ephesus; including the Site and Remains of the Great Temple of

Diana. J. T. Wood. London. 8vo. *Longmans*. 63s.

Architectural Sheet-Metal Work, Compendium of—, embracing Rules and Directions for Estimates, Items of Cost, Nomenclature, Tables of Brackets, Modillions, Dentils, Trusses, Stop-Blocks, Frieze-Pieces, &c. Architects' Specifications, Tables of Tin Roofing, Galvanized Iron, &c., &c.; to

- which is added, the Exemplar of architectural Sheet-Metal Work, containing Details of the Centennial Buildings, and other important Sheet-Metal Work, Designs, and Prices of architectural Ornaments, as manufactured for the Trade, and a Catalogue of Cornices, Window Caps, Mouldings, &c. A. O. Kirtledge. Philadelphia. 8vo. *Batr.* \$10.00.
- Art, a Manual of the historical Development of—; pre-historic, ancient, classic, early Christian; with special Reference to Architecture, Sculpture, Painting and Ornamentation. G. G. Zerrin. London. 8vo. *Hardwicke & Bogue.* 6s.
- Azimuth Tables for correcting Compass Courses and Bearings, being the Sun's True Bearings, corresponding to apparent Time at Place. F. Labrosse. 3d ed. London. 8vo. *Van Nostrand, New York.* \$6.25.
- Birds of Great Britain and Ireland. William Gardiner. New ed., 4 vols. London. 12m. *Hardwicke & Bogue.* 18s.
- Bridges: an elementary Treatise on their Construction and History. F. Jenkin. Reprinted from the *Encyclopædia Britannica*. Edinburgh. 4to. *Longmans.* (London.) 5s.
- Arch and Suspension Trusses. S. H. Shreve. New York. 8vo, illus. (*Van Nostrand.*) Announcement.
- Works in Iron Bridge and Roof Structures. E. Matheson, 2d. ed. London. 8vo. *Spons.* (New York.) 15s.
- Cement, Testing of Portland—J. J. Mann (Minutes of Proceedings, Institution of Civil Engineers). London. 8vo, illus. *Inst. Civil Eng.*
- Centi-Meter-Gramme, Illustrations of the—, second System of Units. Prof. Everett. London. 8vo. *Taylor & Francis.* 5s.
- Dynamics; or, theoretical Mechanics in Accordance with the Syllabus of the Science and Art Department. J. T. Bottomley. London. 12mo. *Collins.* 1s. 6d.
- Eclectic Engineering Magazine (*Van Nostrand's*). Vol. 15, July to December inclusive, 1876. New York. 8vo, illus. \$3.00.
- Fern Paradise. Francis G. Heath. 3d ed. *Hodder & Stoughton.* London. 8vo. 6s.
- Firearms, on the Influence of— upon Tactics; historical and critical Investigations by an Officer of superior Rank in the German Army. Trans. by E. H. Wickham. London. 8vo. *King.* 7s. 6d.
- Fishes; a History of British—. R. Hamilton. 2 vols. London. 12mo. illus. *Hardwicke & Bogue.* 9s.
- Trout Culture; a practical Treatise on the Art of spawning, hatching and rearing Trout. Charles C. Capel. London. 12mo. *Hardwicke & Bogue.* 2s. 6d.
- Forces; Application of physical—. Amédée Guillemin. Trans. by Mrs. Lockyer, ed. by J. Norman Lockyer. London. 8vo, illus. *Macmillan* (New York.) 36s.
- Forests and Moisture; or Effects of Forests on Humidity of Climate. John C. Brown. Edinburgh. 8vo. (*Simpkin, London.*) 10s. 6d.
- Furniture, Designs and Sketches for—, in the Neo Jacobean and other Styles. Bernard E. Smith. London. Folio, illus. (*Van Nostrand, New York.*) \$21.00.
- Game, the large and small —, of Bengal and the Northwestern Provinces of India. J. H. Baldwin. London. 16mo. *King.* 21s.
- Gas; a practical Treatise on the Manufacture and Distribution of Coal—. William Richards. 4to, illus. *Spons.* (New York.)
- Geological Survey, Memoirs of —. England and Wales (English Government Publications). Geology of East Somerset and Bristol Coalfields; or Descriptions of the Rocks comprised in Sheet 19, part of Sheet 35, and adjoining Portions of Sheets 18, 20, and 21 of the (one inch) geological Survey Map of England. Horace B. Woodward. With Notes by H. W. Bristow, W. A. E. Usher, and J. H. Blake, and Appendix by F. Rutley, on the microscopic Character of the eruptive Rocks, and Lists of Fossils by R. Etheridge. London. 8vo. 18s.
- Geology of the northern Part of the English Lake Districts. Quarter-sheet 101 S. E., including Sheets 63. 64. 69. 70. 71. 76, and portions of 54, 55, 56, 57, 62, 65, 68, 73, 74, 75, Cumberland, and 12, 18, 19, Westmoreland, on Scale of 6 inches to Mile. J. Clifton Ward. With Appendix on New Species of Fossils. R. Etheridge. London. 8vo. 9s.
- Hydraulics and hydraulic Motors with Theory of the Steam Engine, trans. from Vol. II. of Weisbach's Engineering, by A. Jay DuBois. New York. *Wiley & Sons.* (Announcement.)
- , rural; a practical Treatise on rural Household Water Supply, giving a full Description of Springs and Wells, Pumps and hydraulic Ram, with Instructions in Cistern Building, Laying of Pipes, &c. W. W. Grier. Philadelphia. 8vo, illus. \$0.75.
- Iron Manufacture, a concise History of —, of the American Colonies up to the Revolution, and of Pennsylvania until the present Time. John B. Pearse. Philadelphia. 12mo, illus. *Allen, Lane & Scott.* \$2.00.
- Library, a Classification and Subject-Index for cataloguing and arranging the Books and Pamphlets of a Library. Melvil Dewey. Boston. 8vo. *Ginn & Heath.* \$1.00.
- Life, the Puzzle of —, and how it has been put together, a short History of vegetable and animal Life upon the Earth, from the earliest Times, including an Account of pre-historic Man, his Weapons, Tools, and Works. Frederick Waddy. London. 12mo, illus. *Longmans.* 6s.
- Magnetic Declination in the United States and other Parts of North America, the secular Change of—. Washington. 4to. *U. S. Coast Survey.*
- Mathematics complete: a Science Manual. H. Major. Manchester. 12mo. (*London. Simpkin.*) 2s. 6d.
- Masonry, Bricklaying and Plastering, theoretical and practical: the new Guide to—. Ed. by R. Scott Burn. London. 4to, illus. (*Van Nostrand. New York.*) \$21.00.
- Mining Engineers, Transactions of the American Institute of —. Vol. IV. May, 1875, to February 1876. Easton. 8vo, illus.
- Machinery, a descriptive Treatise on Machinery, Tools, and other Appliances used in Mining. G. G. Andre. (To be completed in 12 monthly Parts.) Part I. London. 4to, illus. *Spons.* (New York.) \$2.00.
- Mineralogy. Text-Book of —. E. S. Dana. New York. *Wiley & Sons.* (Announcement.)
- Mineral Statistics for 1875. (Parliamentary Report.) London. 8vo. 2s.
- Oil and Water Colors. William Renton. Edinburgh. 12mo. (*Hamilton. London.*) 5s.

- Ordnance**, Description of naval 3-Inch Breech-Loading Howitzers, with Instructions for their Use and Care. M. Sicard. Washington. 8vo, illus. *Gov. Printing Office*.
- Petroleum**, the early and later History of —, with authentic Facts in Regard to its Development in western Pennsylvania, and Sketches of the pioneer and prominent Operators, together with the refining Capacity of the United States. J. T. Henry. Philadelphia. 8vo, illus. *Baird*. \$4.50.
- Price Tables**, specially designed for Use in the Iron, Steel, Brass, Copper, Lead, Tin, and Zinc Trades. George Beecroft. 8th ed., rev. and enl. by John O. Butler. Leeds. 12mo. (*London. Simpkin*.) 16s.
- Railways**. Treatise on the Law of —. William Hodges, 6th ed., by J. M. Lely. London. 8vo. *Sweet*. 38s.
- Railway Tires**, the Fracture of —. W. W. Beaumont, with Abstract of Discussion (Minutes of Proceedings, Institution of Civil Engineers). London. 8vo, illus. *Inst. Civil Engineers*.
- Rivers Pollution Prevention Act**, 1876. W. G. Lumley. London. 8vo. *Shaws*. 3s. 6d.
- Roof Trusses**, graphical Analysis of —, for the Use of Engineers, Architects and Builders. Charles E. Greene. Chicago. 8vo, illus. *Engineering News*. \$1.25.
- Science**. Familiar Lectures on some Mysteries and Discoveries in—. T. S. Philpson. London. 8vo. (*Van Nostrand. New York*.) \$3.75.
- Lectures on some recent Advances in physical—, with a special Lecture on Force. P. G. Tait. 2d ed., rev. London. 8vo. *Macmillan. (New York)*. 9s.
- Outlines of an industrial Science. David Syme. London. 8vo. *King*. 6s.
- Steam Engine**, a practical Treatise on the —, containing Plans and Arrangements of details for fixed Steam Engines, with Essays on the Principles involved in Design and Construction. Arthur Rigg. (To be completed in 12 monthly parts.) Part I. London. 4to, illus. *Spons. (New York)*. \$2.00.
- Trigonometry**, the Elements of plane —. H. N. Wheeler. Boston. 12mo. *Ginn & Heath*. \$1.25.
- Universe** (the). F. A. Pouchet. 4th ed. Edinburgh. 8vo. *Blackie. (London)*. 12s. 6d.
- Vegetable Kingdom**, the Effects of Cross and Self-Fertilization in the —. Charles Darwin. London. 8vo. *Murray*. 12s.

ADDITIONS TO

LIBRARY AND MUSEUM.

NOTE.—“Copies for distribution” named in this list, will, in order of receipt, be sent to members who apply, until the supply is exhausted.

DONATIONS ARE ACKNOWLEDGED AS FOLLOWS:

- From American Institute of Mining Engineers:
Transactions. Vol. IV. May, 1875, to February, 1876. Easton.
- From John Bogart, New York:
Third Annual Report of Board of Commissioners of Department of Public Parks. New York, from May 1st, 1872, to December 31st, 1873.
- From T. C. Clarke, Philadelphia:
Proceedings of the American Philosophical Society for promoting Useful Knowledge. Philadelphia. Nos. 93-95, 97.
- From Samuel S. Cox, M.C. Washington:
Annual Message of President of United States, December 4th, 1876, with Accompanying Documents. Washington.
- Congressional Directory, XLIV Congress, 2d Session. Washington.
- From J. J. R. Croes, Yonkers, N. Y.:
Department of Public Parks, New York. Reports of the Landscape Architect, and the Civil and Topographical Engineer, on laying out the 23d and 24th Wards, New York.
- From M. S. Day, U. S. Navy:
Report of the Trigonometrical Survey of Island of Hokkaido, for 1875. New York.
- From John Eaton, Commissioner of Education, Washington:
Public Libraries in the United States, their History, Condition and Management. Special Report. Parts I. II. Washington.
- From C. Douglas Fox, London:
Institution of Civil Engineers: Charter, By-Laws and Regulations: Subjects for Papers, Session 1875-76. (2 numbers.)
- From G. H. Frost, Chicago:
Graphical Analysis of Roof Trusses. Charles E. Greene, Chicago.
- From S. T. Fuller, Philadelphia:
39th Annual Report of the Philadelphia, Wilmington & Baltimore R. R. Co. for year ending October 31st, 1876. Philadelphia.
- From J. T. Gardner, Albany:
Relation between topographic Surveys and the Study of public Health. J. T. Gardner. Albany.
- From G. E. Gray, San Francisco:
Techachapi Pass, on Line of Southern Pacific Railway (3 photographs).
- From G. S. Greene, New York:
Department of Public Parks, New York. Specifications, &c., for building an Iron Bridge across Harlem River.
- From Albert Hill, New York:
Analysis of Specifications for Steel Cable Wire for East River Suspension Bridge. Albert Hill. New York.
- From Institution of Civil Engineers, London:
List of Members. January 1st, 1877.
Excerpts from Minutes of Proceedings. Sessions 1876-7, Part I., as follows:
Fracture of Railway Tires. W. W. Beaumont, with Abstract of Discussion.

- The Japan Lights with which the Japan Government has provided the leading Ports. R. H. Brunton; with Abstract of Discussion.
- Permanent Way of Railroads. R. Price Williams; with Abstract of Discussion.
- Testing of Portland Cement. I. J. Mann.
- From Capt. W. N. Jeffers, Chief of Bureau of Ordnance, Navy Department, Washington:
- Description of naval 3-inch Breech-Loading Howitzers, with Instructions for their Care and Use. Washington.
- From North of England Institute of Mining and Mechanical Engineers. Newcastle-on-Tyne, England:
- Transactions, September and October. Newcastle-on-Tyne.
- From P. H. Philbrick, Iowa City, Ia.:
- Catalogue of the State University at Iowa City, for 1873-4, 1875-6. (2 numbers.)
- From W. H. Paine, Brooklyn:
- Specifications for Steel Cable Wire for East River Suspension Bridge. (Copies for distribution.)
- From P. P. Panayeff, Moscow, Russia:
- Album of Patterns of Rails for Tramways. Map of Moscow.
- Treatise on Construction of dredging Machines and their Work. P. P. Panayeff, Moscow (Russian).
- From C. P. Sandberg, London:
- On Rail Joints—from "Engineer." London. (6 copies.)
- From I. W. Smith, San Francisco:
- Act relating to Commissioners of Transportation of State of California, their Powers and Duties. Approved April 3d, 1876. Sacramento. (6 copies.)
- Form of Annual Report of Railroad Companies to the Board of Commissioners of Transportation of State of California, for year ending June 30th, 1876. Sacramento. (6 copies.)
- From Society of Architects and Engineers of Hanover:
- Journal of the Society. Vol. 12. Part IV. (German.)
- From the Society of Civil Engineers, Paris:
- Papers and Proceedings of the Society. September, October, 1876. Paris (French).
- From R. H. Thurston, Hoboken, N. J.:
- Exhibits of the Stevens' Institute of Technology at the Centennial Exhibition. Hoboken. (Copies for distribution.)
- From J. N. Tubbs, Rochester, N. Y.:
- Rochester Water Works. Specifications for Cast Iron Distribution Pipes with their Branches; for Excavation and Re-filling of Trenches for Water Pipes, and for Laying such Pipes. (2 numbers.)
- From United States Coast Survey, Washington:
- Secular Changes of magnetic Declination in the United States and other Parts of North America. Washington.
- From Union Iron Co., Buffalo:
- Plans of the Louisiana Draw Bridge (2 sheets).
- From Gen. G. K. Warren, Newport, R. I.:
- Report on the Transportation Route along the Wisconsin and Fox Rivers, in State of Wisconsin. Washington. (Copies for distribution.)
- From Miscellaneous Sources:
- American Library Journal. September 30th, 1876.
- Encyclopaedia Britannica. 9th edition. Vols. I.-V. A to Cle.
- Library Table. Vol. II, No. 2. New York.
- Prospectus of American Wood Preserving Company. New York, 1870.
- Tribune Almanac and political Register for 1877. New York.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: *regular* meetings, when ballots for members will be canvassed, and other business done, Wednesday, March 7th, April 4th and May 2d; and *stated* meetings, for consideration of professional topics and enjoyment of social intercourse, Wednesday, February 21st, March 21st and April 18th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held March 7th, April 4th and May 2d, at 3 o'clock P. M.

A *general* meeting of the AMERICAN INSTITUTE OF MINING ENGINEERS will convene Tuesday, February 27th, at 8 o'clock P. M., at the rooms of this Society. One or more sessions will be held on Wednesday, at the Columbia College School of Mines. Wednesday

evening will be devoted to a *conversazione* at the rooms of this Society, in which members of both associations will take part. An informal discussion will be had on the advisability and practicability of adopting in this country the metric system of weights and measures.

PAPERS HAVE BEEN RECEIVED for presentation to the Society, since the last announcement, as follows:

Failure of the Railway Bridge at Ashtabula, Ohio.

G. K. Warren. January 18th, 1877.

E. S. Philbrick. February 6th, 1877.

"Levees, as a System of reclaiming low Lands."

Discussion—J. F. Flagg. Feb. 13th, 1877.

TITLE PAGE AND INDEX of Volume II, Proceedings, is issued herewith.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. March, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

FEBRUARY 21ST, 1877.—A stated meeting was held at 8 o'clock P. M.

A paper by Charles Macdonald, C. E., of New York, on "The Failure of the Ashtabula Bridge" was read, and a discussion by Messrs. Thomas C. Clarke, Charles Hilton, Charles E. Emery and others followed.

MARCH 7TH, 1877.—A regular meeting was held at 8 o'clock.

A paper by J. Foster Flagg, C. E., of Meadville, Pa., in discussion of "Levees as a System of Reclaiming low Lands*" was read.

Reference was made to work of the Committee on "Quarters for the Society" and the best measures to be taken for purchase of a house for this purpose were considered.

Prof. Robert H. Thurston, Secretary of the United States Board to test Iron, Steel and other Metals, made a verbal report of its operations to date and of its present standing.

OF THE BOARD OF DIRECTION.

MARCH 5TH, 1877.—A special meeting for consideration of applications for admission to the Society was held at 3 o'clock P. M.

MARCH 7TH, 1877.—In absence of a quorum, no stated meeting was held.

* CXXI. Levees as a System of Reclaiming low Lands, by George W. R. Bayley. Transactions, Vol. V, page 115.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Acoustics, Light and Heat. William Lees. Advanced Series. London. 12mo, illus. Collins. 2s. 6d.
- Altitude Tables —. Pocket. G. J. Symons. London. 32mo. Stanford. 2s. 6d.
- Antiquities, Half-Hours among some English — Lewellynn Jewett. London. 8vo, illus. Hardwicke & Bogue. 5s.
- Records of the Past, being English Translations of the Assyrian and Egyptian Monuments. Vol. VIII. London. Bagster. 3s. 6d.
- Art, Persian — R. M. Smith. (South Kensington Museum Handbook.) London. 12mo. (Van Nostrand. New York.) \$1.00.
- Architects and Engineers, Transactions of the Society of — at Hanover. Vol. XXIII., Part I. 4to, illus. (German.)
- Builders' and Contractors' Pocket Book of Prices and Memoranda for 1877. William Young. 4th ed. London. 32mo. Spon's. (New York.) 3s. 6d.
- Architecture. Notes on the Churches of Derbyshire. J. Charles Cox. Vol. II. London. 8vo. Bemrose.
- School — being practical Remarks on Planning, Designing, Building and Furnishing School Houses. Edward R. Robson. 2d ed. London. 8vo. Murray. 18s.
- Birds of Prey (Our); or the Eagles, Hawks and Owls of Canada. Henry G. Vennor. Montreal. 4to, illus. (Worthington. New York.) \$12.00.
- Boilers, a Treatise on Steam — their Strength, Construction, and economical working. 4th ed., rev. Robert Wilson. London. 12mo, illus. Lockwood. 6s.
- Bookbinding at Home: a practical Treatise on Bookbinding. Plymouth. 8vo. McCallum. 6d.
- Botany. Aids to — consisting of brief Outlines, of the elementary Facts of the Science, including a Description of the most important Natural Orders. C. E. Sempie. 12mo. London. Baillière. 1s.
- Brevets, the History and legal Effects of Brevets in the Armies of Great Britain and United States, from their Origin in 1692 to the present Time. Jas. B. Fry. New York. 8vo. Van Nostrand. \$3.50.
- Brewing on scientific Principles, the Art of — New ed., 2n, and imp. London. 18mo. Cornish. 2s. 6d.
- Bridge, Report of Chief Engineer of the New York and Brooklyn —. W. A. Roebling. Brooklyn. 8vo. Eagle Print.
- Bridges, Conditions of Resistance of Swing — Jules Gaudard (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. Inst. Civil Eng.
- Building, Home — a Book of Facts relative to Building, Living, Materials, Costs at about 400 Places from New York to San Francisco, containing original Designs of Buildings, with short descriptive Specifications; also extended Specifications of Materials and Labor, Merchandise and where it may be procured, Cost of Materials at about 400 Places, Descriptions and Statistics for 1876 of over 250 Cities, Towns and Hamlets. E. G. Hussey. 4to, illus. Hussey. \$5.00.
- Carriages, Treatise on military — and other Manufactures of the Royal Carriage Department. W. Kemmis. London. 8vo. 5s.
- Chemical Analysis, and Introduction to qualitative Analysis. F. Beilstein. Transl. from the 3d ed. by I. J. Osbun. New York. 12mo. Van Nostrand. \$0.75.
- Chemistry, the Principles of —; an introduction to modern Chemistry, for the Use of Students. Ira Remsen. Philadelphia. 12mo. Lea. (Announcement)
- Chemist's Manual; a practical Treatise on Chemistry (qualitative and quantitative Analysis), Stoichiometry, Blow-pipe Analysis, Mineralogy, Assaying, pharmaceutical Preparations, human Secretions, specific Gravities, Weights and Measures, &c., &c. Henry A. Mott. New York. 8vo, illus. Van Nostrand. \$6.00.
- Colorist, the textile —. Vol. II. Manchester. 8vo, illus. Palmer & Howe. 21s.
- Colors, the Absorption of Light, and the Colors of natural Bodies. (Science Lectures at South Kensington.) 12mo, illus. Macmillan. (New York.) 6d.
- Commercial Products of the Vegetable Kingdom, considered in their various Uses to Man, as furnishing Food, Clothing, Medicine, &c., and in their Relation to the Arts and Manufactures; forming a practical Treatise and Handbook of Reference to the Colonist, Manufacturer, Merchant and Consumer, on the Cultivation, Preparation for Shipment and commercial Value, &c., of the various Substances obtained from Trees and Plants entering into the Husbandry of of tropical and sub-Tropical Regions. P. L. Simmonds. 2d ed., rev. and imp. London. 8vo. Spon's. (New York.) \$8.00.
- Electricity and the electric Telegraph. George B. Prescott. New York. 8vo, illus. Appletons. \$5.00.
- An Introduction to the Theory of —, with numerous Examples. Linneus Cumming. London. 12mo. Macmillan. (New York.) \$3.00.
- Electrometers. James Bottomley (Science Lectures at South Kensington.) London. 12mo, illus. Macmillan. (New York.) \$0.50.
- Engineering Papers. Abstracts of —, in foreign Transactions and Periodicals. Ed. by James Forrest. (Minutes of Proceedings, Institution of Civil Engineers, Vol. XLVI.) London. 8vo. Inst. Civil Eng.
- Engineers. Annual Report of the Chief of — U. S. Army, to the Secretary of War, for 1876. A. A. Humphreys. 3 vols. Washington. 8vo, illus. Gov. Printing Office.
- Papers on Subjects connected with the Duties of the Corps of Royal —, contributed by Officers of the Royal Engineers. Vol. XXIII. London. 8vo. (Van Nostrand. New York.) \$8.00.

- Entomology, economic —. Aptera. Andrew Murray. (South Kensington Handbooks.) London. 8vo. *Chapman & Hall*. 7s. 6d.
- Fairbairn, William, the Life of — partly written by himself. Ed. and com. by William Pole. London. 8vo, portrait. *Longmans*. 18s.
- Fire Chemistry, or Pyrology. W. A. Ross. London. 4to. *Spon.* (New York.) 36s.
- Food. Some Account of its Sources, Constituents and Uses. A. H. Church. (South Kensington Handbooks.) London. 8vo. *Chapman & Hall*. (Van Nostrand, New York.) \$1.00
- Geology of the eastern End of Essex (Walton Naze and Harwich. Explanation of Quarter Sheet 48 S. E., with the adjoining part of 48 N. E.) William Waitaker. London. 8vo. (*English Geol. Pub.*) 9d.
- Outlines of Field —. Prof. Geikie. (Science Lectures at South Kensington.) London. 12mo, illus. *Macmillan*. (New York.) 6d.
- Gold Worker, the practical —; or the Goldsmiths' and Jewelers' Instructor in the Art of Alloying, Melting, Reducing, Coloring, Collecting and Refining; the Processes of Manipulation. Recovering of Waste, chemical and physical Properties of Gold, with a new System of Mixing its Alloys. Solders, Enamels, and other useful Rules and receipts. George E. Gee. London. 8vo. *Crosby & Lockwood*. 7s. 6d.
- Injectors, their Theory and Use. Trans. from the French of M. Leon Pouchet (Van Nostrand's Science Series.) New York. 12mo. *Van Nostrand*. \$0.50.
- Insects Abroad; being a popular Account of foreign Insects. J. G. Wood. London 8vo. *Longman*. 14s.
- Social Life, mental Powers of — A. S. Packard, Jr. (Half Hour Recreations in Natural History.) Division I, in 12 parts. Boston. 12mo. *Eates & Lauriat*. Per part \$0.25.
- The various Contrivances by which Orchids are fertilized by — Charles Darwin. 2d ed., rev. London. 8vo, illus. *Murray*. 9s.
- Iron and Steel at the Vienna Exhibition. William P. Blake. Washington. 8vo, illus. (*Pease, New Haven*.) \$1.00.
- Landscape Gardening, the Handbook of practical —, designed for City and suburban Residences and Country School-houses, containing Designs for Lots and Grounds, drawn to a scale, with Schedules, showing where each Tree, Shrub, etc., should be planted; Instructions how to form Lawns. Build Roads; on Turfing, Protection and care of Trees, Cuttings, Evergreens, Hedges, Screens, etc.; Perennials, herbaceous Plants, etc.; Descriptions of leading Trees and Shrubs, with Remarks as to Soil and Position. F. R. Elliot. Rochester. 8vo, illus. *Dewey*. \$1.50.
- Majolica and Fayence. Italian, Sicilian, Majorcan, Hispano-Moresque, and Persian. Arthur Beckwith. New York. 12mo, illus. *Appleton*. \$1.50.
- Malster, (the) a compendious Treatise on the Art of Malting in all its Branches. W. R. Loftus. New and rev. ed. London. 12mo, *Loftus*. 3s. 6d.
- Mechanical Engineers. Proceedings of Institution of —, October, 1876. Birmingham. 8vo, illus.
- Metal Work, illustrating the chief Processes employed by the Goldsmith, Silversmith, Jeweler, and Art Workman in Brass, Copper, Iron, Steel, Bronze or other Metal, in 40 parts. London. 4to, illus. *Virtue*. (Announcement.) Per Part 1s.
- Metallurgical Processes. A. W. Williamson. (Science Lectures at South Kensington.) London. 12mo. *Macmillan* (New York.) \$0.20.
- Microscopical Examination of Crude Drugs and other Vegetable Products. Mark W. Harrington. Ann Arbor. 12mo. *Sheehan & Co.* (Van Nostrand, New York.) \$0.40.
- Microscopist the —, a Manual of Microscopy and Compendium of the microscopic Sciences. Micro-Mineralogy, Micro-Chemistry, Biology, Histology and Pathological Histology. J. H. Wythe. 3d ed., rewritten and enl. Philadelphia. 8vo, illus. *Lindsay & Blakman*. \$4.50.
- Mining, Lectures on —. J. Callon, trans. by P. Le Neve Foster and W. Galloway. Vol. 1: text, 8vo: 4to Atlas of plates. London. *Dulau*. 23s.
- Money, bi-Metallic —. Emile de Lavaleye, trans. by George Walker. New York. 8vo. *Banker's Mag. Off.* \$0.30
- Natural History, Curiosities of —. 1st Series. Francis T. Buckland. New ed. London. 12mo. *Bentley* 3s. 6d.
- Nautical Magazine for 1876. London. 8vo. *Simpkin*. 15s.
- Naval History, a Text-Book of Facts for the Use of Students. John Thompson. Washington. 12mo. *Shillington*.
- Navigation made easy; or the Mariners' daily Assistant and Self-Instructor. Henry Marshall. New York, 8vo. *Van Nostrand*. \$1.50.
- Ornament, modern Surface —. Original Designs, in 6 parts of 4 Plates each. New York. 4to. *Sabin*. Per part \$1.00.
- Percentage, the 30 possible Problems of — embracing a full and exhaustive Discussion of the Theory of general Percentage. W. H. Bradford. Weedsport, 16mo. *Bardeen & Co.* \$0.25.
- Perspective, third Grade — in 12 Parts. H. J. Dennis. London, 16mo. *Baillière*. Per part 1s.
- Political Economy, Introduction to — —. Arthur L. Perry. New York, 12mo. *Scribner*. \$1.50.
- Photography, Annual of — and photographic News Almanac for 1877. London, 12mo. *Piper*. 1s.
- Pumps. History and theoretical Laws of centrifugal — as supported by Experiment and their Application to this Design. R. Clerc Parsons (Minutes of Proceedings, Institution of Civil Engineers.) London, 8vo, illus. *Inst. Civil Eng.*
- Railroad Commissioners of Massachusetts, Eight Annual Report of the Board of —. Boston, 8vo.
- Railway Passengers and Railway Companies; their Duties, Rights and Liabilities. Louis A. Goodeve. London, 8vo. *Stevens & Haynes*. 5s.
- Ship-Building on the Merrimac River. Historical Sketch of —. John J. Currier. Boston, 8vo. *Williams* \$0.50.
- Slide Rule. Hand-book of —. W. H. Bayley. New and rev. ed. London, 12mo. *Bell & Sons*. 5s.
- Steam Engine, Pocket-book on the compound — —. N. P. Burgh. London, 16mo, illus. *Lockwood & Co.* (Van Nostrand, New York) \$3.75.

Trees. Hand-book of hardy Trees, Shrubs, and herbaceous Plants, containing Descriptions, native Countries, &c. of a selection of the best Species in Cultivation; together with cultural Details, comparative Hardiness, Suitability for different Situations, &c., based on the French of Decaisne and Naudin. W. B. Hemsley. London, 8vo. *Longmans*. 12s.

Water System, the Chalk —. Joseph Lucas. With abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers.) London, 8vo. *Inst. Civil Eng.*

Weather, the — ; a new Plan of forecasting Gales and Floods, and a new Theory of the Cause of Earthquakes, described in a Series of Letters, with Diagrams and an explanatory Preface. W. G. Wenley. Chelmsford, 8vo. (*Simpkin. London.*) 1s. 6d.

Wire Rope. Transmission of Power by —. Albert W. Stahl. (Van Nostrand's Science Series). New York, 12mo. *Van Nostrand*. (Announcement.) \$0 50.

Wool-Carder's Vade Mecum, a Hand-book containing History of the woolen Industry. W. C. Bramwell. Terre Haute, 16mo. (*Van Nostrand. New York.*) \$1.00.

Wool-Dyeing, Six Cantor Lectures on —. delivered before the Society of Arts. George Jarmain. Rep. from the Journal, Manchester, 8vo. (*Simpkin. London.*) 2s. Year book of Facts in Science and the Arts for 1876. James Mason. London, 8vo. *Ward & Lock*. 2s. 6d.

Yellowstone National Park, and the Mountain Regions of Portions of Idaho, Nevada, Colorado and Utah. F. V. Hayden. Boston, 4to, illus. *Prang*. (Announcement.)

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: *regular meetings*, when ballots for members will be canvassed and other business done, Wednesday, April 4th, May 2d, and June 6th; and *stated meetings*, for consideration of professional topics and enjoyment of social intercourse, Wednesday, March 21st, April 18th and June 20th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held April 4th, May 2d and June 6th, at 3 o'clock P. M.

At the next *regular* meeting of the Society (April 4th), ballots for members will be canvassed; the Paper by Charles Macdonald, C. E., of New York, on "The Failure of the Ashtabula Bridge," read February 21st, will be discussed, and other business done.

THE NINTH ANNUAL CONVENTION of the Society will be held in New Orleans, Tuesday, Wednesday and Thursday, April 24th, 25th and 26th next.

Sessions for the consideration of professional subjects, and one for the transaction of regular business, will be held, at the Chamber of Commerce (on Common Street), beginning at 9½ o'clock A. M. Tuesday, and continued on Wednesday.

It is proposed, on Thursday to visit objects of interest in and about New Orleans, and to have the Convention dinner at 7½ o'clock that evening; on Friday and Saturday, to inspect the jetties at the mouth of the Mississippi, stopping on the return at the orange groves and at some of the sugar plantations; and on Monday to go to the Bonet Carre Crèveasse.

A trip to Galveston (by steamer leaving New Orleans, Wednesday, May 2d), to visit that city and the United States works there, is also proposed.

In accordance with the rules governing Conventions,* a list of topics to be considered at the regular sessions is submitted, with references to the Papers treating these subjects, published in Transactions since May, 1876.†

I. BRIDGES

CXXXVII. The Failure of the Ashtabula Bridge. C. MACDONALD. *March*.

CXL. Approximate Determination of Stresses in the Eye Bar Head. W. H. BURR. *April*.

II. HYDRAULICS.

CXXV. On the Failure of the Worcester Dam, a Report. T. G. ELLIS, Chairman. *July*.

CXXVI. Cut-offs on the Mississippi River, their Effect on the Channel, above and below. C. G. FORNEY. *September*.

CXXX. Efficiency of Steam Vacuum Pumps. J. F. FLAGG. *December*.

CXXXI. Principles of tidal Harbor Improvements, as applied at Wilmington, Cal. C. B. SEARS. *December*.

CXXXVI. A Water Conduit under Pressure. J. T. FANNING. *March*.

CXXXIX. Consumption and Waste of Water delivered by public Works. J. H. HARLOW. *April*.

Report of Committee on Gauging of Streams. J. J. R. CROES, Chairman. *To be called for.*

* Proceedings, Vol. I, page 172.

† This list will be corrected and completed, in April Proceedings.

III. MASONRY.

CXXXIII. Reconstruction and Enlargement of the Cork Run Tunnel, on the Pittsburgh, Cincinnati & St. Louis Railway. M. J. BECKER. *January.*

CXXXIII. Notes on Masonry of the East River Bridge. F. COLLINGWOOD. *January.*
Report of Committee on the Nomenclature and Classification of Masonry. J. J. R. CROES, Chairman. *June, and to be called for.*

IV.—RAILROADS.

CXXXVIII. On the Form, Weight, Manufacture and Life of Rails, a Report. A. WELCH, Chairman. *October.*

CXXXIX. A cheap Transfer Table. W. P. SHINN. *December.*

CXXIV. On Railroad Accounts and Returns. W. P. SHINN. *June.*

Report of Committee on uniform Accounts and Returns of Railroad Companies. W. P. SHINN, Chairman. *November, and to be called for.*

Report of Committee on Resistances of Railway Trains. W. P. SHINN, Chairman. *To be called for.*

V.—STRENGTH OF MATERIALS.

CXXVII. Qualities of Iron and Steel. W. METCALF. *October.*

CXXIV. The Rate of Set in Metals subjected to Strain for considerable Periods of Time. R. H. THURSTON. *January.*

Report of Committee on Tests of American Iron and Steel. W. S. SMITH, Chairman. *November, and to be called for.*

VI.—MISCELLANEOUS.

CXXXV. A Memoir of American Engineering. J. B. JERVIS. *February.*

CXXXVIII. Co-Ordinate Surveying. H. F. WALLING. *March.*

Report of Committee on Metric System of Weights and Measures. C. HERSHEL, Chairman. *To be called for.*

The following are set down for

THE BUSINESS SESSION :

Report of the Centennial Commission of the Society. T. G. ELLIS, Chairman. *To be called for.*

Report of Committee on Quarters for the Society. J. BOGART, Chairman. *To be called for.*

The topics will be taken up for discussion in order, and members are invited to take part in person, or by sending what they would say ; it is hoped that those having memoranda of experience or data relating to any of the subjects named, will present it. Papers on other professional topics are solicited, and if announced in time, their titles will be included

in the Schedule to be published in April Proceedings. Notice of intention to present a Paper or to take part in the discussion, should be given to the Secretary *at once.*

The Boston Society of Civil Engineers, of Boston ; the Civil Engineers' Club of the Northwest, of Chicago ; and the Engineers' Club of St. Louis, have been invited to attend the Convention, and to take part in the proceedings.

It is proposed that Eastern members proceed together from New York, join the Western members at Louisville, and go from there, either by rail to Memphis and steamboat down the Mississippi, or by rail direct to New Orleans. The time (in hours) required will be about as follows :

New York to Louisville, rail.....	31
Louisville to Memphis, "	16
Memphis to New Orleans, river... ..	36
	— 83
New York to New Orleans, all rail... ..	65

As soon as arrangements are completed, a time-table and schedule will be issued.

Head quarters of the Society in New Orleans will be at the St. Charles Hotel.

PAPERS ON ENGINEERING SUBJECTS, giving results of practice, or in discussion of pertinent theoretical questions, are desired from members of the Society ; their comments (whether or not present at meetings of the Society), upon papers published in Transactions, are solicited, and they are urged to contribute from note-books and other similar records, whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, Vol. I.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th, next. The conditions of award are set forth in the Code of Rules, herewith published ; a copy will be furnished to members upon application.

A PAPER HAS BEEN RECEIVED for presentation to the Society since the last announcement, as follows :

The Failure of the Ashtabula Bridge.

C. MacdonaldFebruary 21st, 1877.

ADDITIONS TO LIBRARY AND MUSEUM, to contain acknowledgments of contributions to the Library, through the Centennial Commission of the Society (referred to, in Transactions, Vol. VI, page 69), will appear in Proceedings for April.

RATES OF POSTAGE on transient matter sent to the Society from domestic post-offices, except New York, are as follows :

On books, pamphlets, periodicals, maps and corrected proof sheets, *one cent per two ounces* ; on photographs, lithographs, and engravings, *one cent per ounce* ; and on letters and other mail matter, either wholly or partly in writing (except corrected proofs), sealed packages, or those wrapped so as not to be conveniently examined without destroying the wrapper, *three cents per half-ounce*. The sender may write or print his address in or on a package, and state names and number of articles enclosed, without extra charge.

Matter upon which not enough postage is prepaid, is charged on delivery with *once or twice* the deficiency, according to class ; and it is not infrequent that from \$0.50 to \$5.00 is thus charged.

The attention of members is called to these conditions. Generally, it is better to forward a package by express when the postage thereon exceeds \$0.35, or the rating is uncertain.

As APPENDIX to this number of Transactions (by the courtesy of W. A. Roebling, Chief Engineer, and O. C. Martin, W. H. Paine F. Collingwood, and G. W. McNulty, Assistant Engineers), is issued:

Report of the Chief Engineer of the New York and Brooklyn Bridge, January 1st, 1877.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election.
COXE, ECKLEY B. Drifton, Pa.	February 7, 1877.
GUNNELL, WILLIAM C. Eng. of New Capitol, Hartford, Conn.	" " "
HORTON, SANDFORD. 176 Franklin street, New York.	" " "
MCCOMB, DAVID E. As't Eng. on Work, west of Capitol, Washington, D. C.	" " "

CHANGES AND CORRECTIONS.

BILLIN, CHARLES E. 4039 Locust street, Philadelphia, Pa.	
BURR, JAMES D. Sup't Bridges and Buildings, A. T. & S. F. R. R., Topeka, Kansas.	
COOPER, THEODORE. Office of Ch. Eng. Erie R'y, New York.	
DOANE, EDWIN A. Box 317, Meadville, Pa.	
GRAY, SAMUEL M. City Eng., 17 N. Main st., Providence, R. I.	
HILL, JOHN W. Box 729, Hamilton, O.	
JORDAN, GABRIEL. Ch. Eng. & Gen. Sup't, M. & C. R. R., Memphis, Tenn.	
LEAVITT, ERASMUS D., Jr. 143 Magazine street, Cambridgeport, Mass.	
MCCLINCKOCK, WILLIAM H. As't Eng. Water Works, 175 Third av., Louisville, Ky.	
TALCOTT, COOK San Francisco, Cal.	
TYSON, HENRY Box 707, Baltimore, Md.	
WHITE, W. HOWARD. 13 Revere st., Boston, Mass.	
WHITFORD, OSCAR F. Joplin, Mo.	

RESIGNED.

SARGENT, JOHN H. Cleveland, O.	February 28, 1877.
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. April, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MARCH 21ST, 1877.—A quorum not being present, no stated meeting was held.

APRIL 4TH, 1877.—A regular meeting was held at 8 o'clock, P. M.

The vote on admission to membership was canvassed and the following declared elected: Members—Caleb W. Durham, of Chicago, Ill.; Mordecai T. Endicott of New London, Conn.; Bryant Godwin of Albany, N. Y.; Thomas S. Hardee and Benjamin M. Harrod of New Orleans, La.; Thomas C. Keefer of Ottawa, Can.; Louis J. le Conte of Oakland, Cal., and Nathan M. McDowell of Alleghany City, Pa.; Associate—Arthur S. Hardy of Hanover, N. H., and Junior, George O. Knapp of Hartford, Conn.

A paper by Julius E. Streidenger, C. E., of New York, on "The simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses," was read by him and discussed by Messrs. Francis Collingwood, Charles E. Emery, Edward P. North, Richard P. Rothwell and others.

A portfolio containing photographs of the principal bridges and other structures on the Lake Shore & Michigan Southern R. R., given to the Society by Mrs. Charles Collins, in behalf of her deceased husband, the late Chief Engineer of that road, was presented with a letter from her, and the President and Secretary were instructed to formally express to the donor the thanks of the Society for this valuable addition to the Library.

Announcement was made that Theodore G. Ellis had been appointed member of Committee on Library, in place of Matthews N. Forney, resigned from that committee and appointed member of Committee on

Finance ; also that of those appointed under resolution adopted February 7th last, as a committee to report to the Society a form of memorial to Congress to further the adoption of metric standards, Messrs. Clemens Herschel, Robert Briggs and Frederick Brooks had accepted, and Messrs. Julius E. Hilgard and Theodore G. Ellis had declined.

Certificate of award to the Society by the "United States Centennial Commission, International Exhibition, 1876," for "drawings, photographs, models, manuscripts and various publications illustrating the work of the Society and the progress of Civil Engineering," and a letter of thanks from the American Institute of Mining Engineers, by Prof. Thomas M. Drown, Secretary, for courtesies shown the association during its February meeting, were read.

The death, on January 10th, of William Grain, C. E., late of Fergus, Ontario, Can., and Member of the Society from February 16th, 1870, was announced, and it was moved that a committee be appointed to prepare a memoir of the life and professional services of the deceased.

The following amendments to the By-Laws were proposed by J. James R. Croes and seconded by Edward P. North ; under the rule, consideration was deferred to a subsequent regular meeting of the Society.

SECTION.—First. Votes for officers of the Society at the annual meeting in November may be sent by mail, enclosed in two sealed envelopes, the outer one of which shall be endorsed with the voter's signature, and all such votes shall be counted on the first ballot for officers.

Second. If it should appear that, for any office a majority of the votes cast were not for one person, the meeting shall proceed to vote by ballot in the usual way for such officer, the choice of candidates being limited to the two persons not elected for whom the greatest number of votes had been previously cast for such office. In case three or more names have received an equal number of votes, the choice shall be made from among those names.

Third. At the Annual Convention, a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention. This committee shall present to the Board of Direction, on or before the first day of October ensuing, the names of the persons selected by them as candidates for officers. Of these, at least one Vice-President, three Directors, the Secretary and the Treasurer shall be Resident Members.

Fourth. The Board of Direction shall thereupon cause such list to be posted in the rooms of the Society, and shall issue, at least twenty days before the Annual Meeting, a letter ballot containing the names thus proposed.

Fifth. Any five members, not officers of the Society, may present to the Board of Direction, on or before October 1st, a list of names proposed by them for officers, which list or lists shall also be issued for ballot.

Sixth. No member of any Nominating Committee shall be presented by such committee as a candidate for office.

APRIL 18TH, 1877.—A stated meeting was held at 8 o'clock, P. M.

A letter, dated January 29th, 1799, from Gen. Philip Schuyler to Richard Varick, Mayor of New York, in regard to supplying the city with water from the Bronx River, was read and a copy of same presented to the Society by John Schuyler.

Discussion of the paper by Charles Macdonald, C. E., on the "Failure of the Ashtabula Bridge" was resumed, and communications relating to the subject, from Squire Whipple and Alfred P. Boller, were read.

OF THE BOARD OF DIRECTION.

APRIL 4TH, 1877.—A stated meeting was held at 3 o'clock P. M.; reports of committees were presented and considered, change of quarters of the Society determined upon, appropriations made, and business relating to payments of bills, members' back dues, and other financial matters was done.

NOTES AND MEMORANDA.

REPORTS OF MEETINGS.

TESTS OF AMERICAN IRON AND STEEL.—At the meeting of the Society, March 7th, 1877, Prof. Robert H. Thurston was called upon to report the status of the "United States Board appointed to test Iron, Steel and other Metals." He gave an account of the origin of the movement to obtain the appointment of such a Board, and described the organization of that body, its plans and methods of work, its present position and its purposes for the future.

He remarked that the Board, having apparently reached very nearly the end of its history, it might be well to look to the beginning of the work. He proposed to follow closely the line of discussion pursued when making a similar statement, by request, before the Senate Committee on appropriations, March 6th, at which time he had been asked as Secretary of the Board, to give an account of operations.

This plan of a systematic and thorough determination of the properties of the materials of construction made in the United States, and the scheme of making a really scientific examination of the composition and value of the metals used in their production, had an origin in two serious needs, and at a period which ante-dated the speaker's entrance into the Society. These two necessities arose from commercial conditions and from the requirements of constructing engineers.

We have been for years, importing cast iron from abroad while we have domestic products of equal and even greater intrinsic value selling in our markets at lower price. We are importing boiler plate at 11 cents a pound when we can purchase American steel, vastly superior in all respects for the special purposes to which the former is applied, at 8 cents. We import vast quantities of foreign steel tools, when, at Pittsburgh and elsewhere, we make steel fully its equal. In New England and Pennsylvania, we have ores from which are made the finest cast-iron ordnance in the world. In Ohio, we make a metal for car-wheels such as never is seen in Europe, and of such tenacity and elasticity that foreign engineers listen incredulously when it is described. Our Lake Champlain ores make an iron equal to even Swedish for conversion into steel, and around Lake Superior and Missouri we have deposits from which come Bessemer metal vastly superior to the phosphorus-charged metal imported. New Jersey supplies us with zinc which meets with no competition as a pure metal and which can be used without purification for even chemical purposes; and our native copper is, as I know by experiment, absolutely free from admixture with injurious elements.

Yet, notwithstanding the fact that we possess the purest and best ores and make the best metals, we continue purchasing abroad.

This fact arises : *first*, from a natural conservatism which induces us to continue to pursue a course to which we have been accustomed even after we knew it to be an improper one ; *second*, partly from that unfortunate American habit of self-depreciation which assumes, whatever comes from abroad to be, from that fact, superior to the product of our own country and of our own industry ; and *third*, from the fact that our own people do not know and cannot readily be made to believe that our own materials are so excellent.

It was to meet the last difficulty, partly, that this Board was proposed. No private individual can afford to attempt the systematic and only truly economical methods of development of these facts, and no one has interest so general as to make it imperative that he should do so, were it in his power. Even were the work done, and well done, by a combination of private interests, it would still have comparatively little value, as the public invariably looks with distrust upon all statements made by private individuals, and suspects that private interests may have given tone to their reports. The maker of the very best iron, or of the best possible steel, cannot prove beyond cavil that his product is better than any similar metal purchased abroad. Only the general government can institute an investigation that shall cover the whole field, that shall be systematic and scientifically thorough, and of which the reported results shall be accepted without distrust.

The second of the two classes of necessities leading to the creation of the Board was felt most keenly by our engineers and constructors, and by our manufacturers of machinery and of parts of structures. They knew comparatively little of the strength of our metals in small parts, and were still more seriously ignorant of the effect of making up any material in large sections and into the heavy members of bridges and other structures. They could not predicate dimensions on well ascertained measures of the strength of our iron, and were ignorant of the loads which could be sustained by heavy beams, girders, and columns made of this or of any other metals.

For years, they had been compelled to base their calculations on tables of strength of materials furnished by foreign experimenters, as Hodgkinson, Tredgold, Barlow, Morin, Rondelet, and Muschenbroeck, who gave the results of experiments on Carron iron and other metals, whose names were strange to American engineers, and which our builders never use. Recently, Kirkaldy, Styffe and some German experimenters have given us

valuable information, but nothing of any considerable value has been published in reference to our domestic materials.

These facts, and many more which the speaker had not time to consider, led to the appointment by the Society, several years ago, of a committee to secure the inauguration of scientific and exhaustive examination of our American materials by a Government commission. This committee sent a delegation of its own members, and of other members of the Society, before the House Committee on Appropriations, in the spring of 1875, and secured the modification of a bill already in committee, which had originated with the Architect of the Treasury, and its adaptation to the plan proposed. Under the provisions of a bill thus secured from Congress, the President appointed a commission, consisting of two army and two navy officers and three experts from civil life ; and this Board was organized and immediately adopted a very comprehensive plan of research, which was reported to the Society a year ago.* Committees appointed to carry out the investigations proposed, issued circulars, which were published in all scientific and engineering periodicals, as well as in the Transactions of the Society, and which detailed these plans of work and asked advice and information. These circulars brought out very little useful material.

The Board contracted for a large testing machine, combining the plans of Messrs. Albert H. Emery and Charles E. Emery—the latter a Member of this Society—which machine was expected to have been long ago completed, but is not yet ready for work. It was intended to test large pieces, as heavy beams, girders, and columns.

While awaiting the completion of the machine, the Committees of the Board conducted their special investigations, where they could do so without the use of the large machine, making use of such other machines as were available.

Some of the Committee have reports, either completed or in progress. The Committee on Wrought Iron had finished several investigations of the methods of making iron, on the effect of impact on metal, on the effect of various strains, &c., &c. The Committee on Chain Cables has been studying the methods and material of cable manufacture. The Committee on Tool Steel had completed a series of tests of the value of steels for cutting tools ; analysing them to determine

* See Vol. I., page 222 ; Vol. II., page 26, &c.

their composition, and breaking them to ascertain their mechanical properties. The report is in preparation. The Committee on Abrasion and Wear had completed that portion of its work formerly reported as in progress. The Committee on Metallic Alloys has determined the tenacity and other forms of resistance of all copper-tin alloys, their ductility, resilience, density, &c.; and the report is complete and in the hands of the copyist. A similar series of tests of copper-zinc alloys has been completed, and the report is in preparation; and an investigation of the properties of triple alloys of copper, tin, and zinc is in progress. The speaker described the methods of research adopted and indicated the general nature of results attained. The Committee on the Effects of Temperature has collected a large quantity of materials for test, and is still getting samples. The investigation is planned, but not yet commenced.

As just indicated, the Board has been working steadily for two years while awaiting the construction of its testing-machine—has done a large amount of work, and has completed, or has in preparation, some extended and probably valuable reports. The Board has been criticised because no reports have been yet made public. It should be remembered that where researches require months for their prosecution, the preparation of reports upon them usually requires an equal length of time, or sometimes greater. The speaker has sometimes acquired information in one day's work, which he had been unable to reduce to proper shape for publication in many days. Such criticism is evidently unjust, and never comes from those who have had experience in a kind of work in which the results of weeks of investigation are sometimes expressed in a single paragraph. Furthermore, the Board can only report to the President at the proper time, and the reports can only reach the country through the action of Congress. They can, therefore, not be presented piecemeal or at any desired date.

The speaker was permitted to state ascertained facts, but the Board had no authority to publish the reports in which only those facts could be found in their proper relations, except by presentation to the President, and publication under Act of Congress.

The speaker then described some methods of research adopted, and stated some interesting facts brought out by their application, including the reasons of variation of strength of iron and steel in bars of different sizes, the effect of strain after periods varying from one second to one year, the relation of composi-

tion and of strength and ductility to the value of steel for tools, the methods which had enabled him to determine the mechanical proportion and value for constructive purposes of all possible copper-tin, copper-zinc, and copper-tin-zinc alloys, the purposed methods of determining the effect of temperature, etc., etc.

The speaker stated that reports of progress had been made to the President, and that, a year ago, Congress had been requested to make an appropriation to enable the Board to continue its work, and to do some heavy work with its testing machine. The appropriation was granted by the Senate, but defeated by the House Committee. The same experience had been met with during the session just closed. No opposition had been met with either in the Senate or on the floor of the House, and every well known member of either party, and especially those of recognized intelligence and standing, had taken real interest in the matter. The House Committee, with but one or two exceptions, had, however, determinedly refused, and had even inserted a provision in the Sundry Civil Bill of 1876-7, extinguishing the Board, when the money in hand should have been expended.* That provision remains a law. The appropriation in hand will be expended during the coming year, 1877-8, and this Board, which had been procured and sustained by such earnest action, and so great an amount of hard work on the part of members of the Society, will be disbanded just as its plans and methods are thoroughly settled, and are bringing forth abundant fruit, and just as it is ready to undertake the most important of its researches—that on large parts of structures.

It is possible that earnest and determined action on the part of the Society, may preserve it, but it can only be done by taking steps as will convince the members of the House Committee on Appropriations of the next Congress:—

1st. That this work is of national importance in developing our mineral resources and manufacturing industries, and in securing safety of all large constructions; that it is an absolute necessity.

2d. That no individual can do such work, and that no combination of private individuals can make a complete and satisfactory investigation, even were the results of such work likely to be accepted as authoritative as would be the right of a Government commission.

3d. That, while this work is as appropriately

* Vol. II, page 100.

a matter of general legislation as the support of the Patent office, the Department of Agriculture, or of topographical and hydrographical surveys, it will secure returns of incalculable value, with insignificant expenditure.

If members of the House Committee can be shown these facts, the Board may possibly be continued; but it will only be by such convincing evidence as will fully controvert their pre-existing ideas, and convert them to a broader and more liberal faith. The Board has been formally endorsed by this Society, by the American Institute of Mining Engineers, the Iron and Steel Association, by all the technical schools, and by other institutions of learning, and has kept the members of the committees informed of the progress of its work. It has not been successful in securing proper recognition, notwithstanding all this, and notwithstanding the efforts of prominent men of both parties in Congress. It has done all that it, in propriety, can do, and will probably now, simply present its reports on Committee work, state its readiness to go on with the greater work assigned it, and leave the matter to be decided as shall be determined by the House Committee on Appropriations, in the light of such evidence as they may thus be given. There is imminent danger that the Board will be discharged before it can report on the strength of a single 15-inch beam, or determine a single law re-

lative to the resistances of parts of structures. It has, however, accepted its duties, and has undertaken them in good faith. Its members have discharged their duty faithfully, so far as they have been permitted, and have devoted, voluntarily, a vast amount of time to special research without compensation, and their only regret will arise from a natural reluctance to see their work interrupted, just when most certain to prove useful, and from the disappointment which, in common with all interested in the movement, they must feel at this premature interruption of a great and needed work.

They will find some slight compensation in the facts that they have, at least, organized a scheme which may, at some future time, be carried out by abler minds, that they have stimulated foreign nations to the consideration of the necessity of doing similar work, and thus, indirectly benefitting the world, and that they have been permitted to collect some valuable information in several important fields.

The speaker concluded by stating his belief that the importance of the subject and the evident and eager interest which had been taken in the matter by nearly all the members of the Society, would justify him in having so fully and freely stated the present status, and probable future of the Board appointed to test Iron, Steel and other Metals.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Alcohol, Results of Researches in —. Benjamin W. Richardson. London. 12mo. *Tweedie*. 6d.

Algebra, New Developments of —, containing many valuable Rules, Hints, and Suggestions never before published, designed to abridge and facilitate the Labor of Teachers and Students. T. Henderson. Philadelphia. 12mo. *Claxton, Remsen & Hefelfinger*. \$1.00.

American Register, or Blue Book for 1877. J. Disturnell. New York. 8vo. *Disturnell*. \$2.00.

Animal Kingdom (the); arranged after its Organization: forming a Natural History of Animals. G. Cuvier, with Additions by W. B. Carpenter and J. O. Westwood. New ed. London. 8vo, illus. *Hardwicke & Bogue*. 21s.

Anthracene; its Constitution, Properties, Manufactures, and Derivations, including artificial Alizarin, Anthrapurpurin, &c., with their Application in Dyeing and Printing. G. Auerbach. Trans. and ed. from the rev. Manuscript of the Author by Wm. Crookes. London. 8vo. *Longmans*. (*Van Nostrand*. New York.) \$6.00.

Architectural Styles, a Handbook of —. A. Resengarten, trans. from the German of W. Collett Sanders. London. 8vo, illus. *Chatto & Windus*. 21s.

Art, a Manual of the historical Development of —, prehistoric, ancient, classic, early Christian, G. G. Zerffi. New York. 12mo. *Scribner, Welford & Armstrong*. \$3.00.

— Principles and Practice of —. J. D. Harding; ed. by William Walker. New ed. London. Folio. *Kent*. 52s. 6d.

- South Kensington Art and Science Handbooks. Conferences, held in Connection with the special Loan of scientific Apparatus, 1876. Physics and Mechanics, by Spottiswoode, Huggins, Lockyer, Thomson, Tyndall, Bousquet, Chappell, Earl of Rosse, De La Rue, Whitworth, Merrifield, Russell, Kennedy, Stevenson, and others. (London reprint.) New York, 12mo. *Scribner, Welford & Armstrong.* \$2.25.
- What is Art; or, Art Theories and Methods concisely stated. S. G. W. Benjamin. Boston. 8vo. *Lockwood, Brooks & Co.* \$0.75.
- Arts, the Anatomy and Philosophy of Expression, as connected with the face—. Charles Bell. New York. 12mo, illus. *Scribner, Welford & Armstrong.* \$2.00.
- Artillery, Elements of Field —, designed for the use of Infantry and Cavalry Officers. H. Knollys. London. 8vo. *Blackwoods.* (*Van Nostrand.* New York.) \$3.75.
- History of the Organization, Equipment, and War Services of the Regiment of Bengal Artillery, compiled from published Works, official records, and various private Sources. F. W. Stubbs. London. 8vo, illus., 2 vol. *Henry S. King.* 32s.
- Primer for Garrison—. M. F. Downes. London. 12mo. *Cloves.* 2s.
- Astronomy, Handbook of descriptive —. G. F. Chambers. 3d ed. London. 8vo, illus. *Macmillan.* (*New York.*) 28s.
- Belting, a Treatise on the Use of —, for the Transmission of Power. John H. Cooper. Philadelphia. 8vo, illus. (*Varion, Remsen & Haffelinger.* (Announcement.)
- Bird Preserver, the British — or, how to skin, stuff, and mount Birds and Animals; with a Chapter on their Localities, Habits, and how to obtain them; also Instructions on Moth and Butterfly Catching, Setting and Preserving, with practical Illustrations. Samuel Wood. London. 12mo, illus. *Warne.* 1s.
- Boiler Incrustation and Corrosion. F. J. Rowan. (*Van Nostrand's Science Series.* London reprint.) New York. 12mo, illus. *Van Nostrand.* \$0.50.
- Botany. Flowers, and the Plants they grow on. U. Ware. Clifton. 12mo. (*Kent, London.*) 5s.
- Text-Book of structural and physiological Botany. O. W. Thome. Trans. and ed. by Alfred W. Bennett. (Text-Book of Science.) London. 12mo, illus. *Longmans.* 6s.
- Bridges. Works in Iron. Bridge and Roof Structures, with Examples of Structures made and erected by Andrew Haudyside & Co.; also Vocabulary of technical Terms used in the Design, Manufacture, and Commerce of Iron Structures.—English, French, German, Italian, Spanish. Ewing Matheeson. 2d ed. London. 4to, illus. *Spons.* (*New York.*) \$6.00.
- Builders' and Contractors' Price Book for 1877. *Lockwood's*—rev. and ed. by Francis T. W. Miller. London. 12mo. (*Crosby & Lockwood.* 4s.
- Price Book for 1877. Laxton's. London. 12mo. *Kelly.* 4s.
- Prices, 1877. Skyring's. London. 8vo. *Simpkin.* 4s.
- Calculus, an elementary Treatise on the differential Calculus, containing the Theory of Plane Curves, with numerous Examples. Benj. Williamson. 3d. ed., rev. and enl. London. 12mo. (*Van Nostrand, New York.*) \$5.25.
- Catalogue, the London —, of Periodicals, Newspapers, &c., for 1877. London. 8vo. *Longmans.* 1s.
- Chemia Courtata; or, the Key to modern Chemistry, adapted especially to the Wants of Students preparing for Examinations, Persons who have learned the Old Notation and wish to learn the modern System. &c. A. H. Kollmayer. Philadelphia. 12mo. (*Van Nostrand.* New York.) \$2.25.
- Chemical Problems, a Series—for Use in Colleges and Schools. T. E. Thorpe, with Preface by Prof. Roscoe. 5th ed. London. 18mo. *Macmillan.* (*New York.*) \$1.00.
- Chemistry, a Primer of—, including Analysis. Arthur Vacher. London. 12mo. *Churchill.* 1s.
- Clock and Watch Makers' Manual, new and complete—comprising Descriptions of the various Gearings, Escapements and Compensations now in Use in French, Swiss and English Clocks and Watches, Patents, Tools, &c., with Directions for Cleaning and Repairing. Comp. from the French, with an Appendix containing a History of Clock and Watch Making in America. Mary L. Booth. New ed. New York. 12mo, illus. *Wiley & Sons.* \$2.00.
- Commerce. Dictionary, practical, theoretical, and historical, of—and commercial Navigation. J. B. McCulloch, with Biographical Notice of the Editor. New ed., rev. and corr., Supplements being added to show the Progress of British commercial Legislation down to the present Time. London. Ed. by Hugh G. Reid. 8vo. *Longmans.* 63s.
- Commercial Knowledge, a Guide to—containing an Explanation of Terms and Practices in daily Use in the Counting-house, Bank, Warehouse, &c. B. Bannister Turner. London. 12mo. *Stewart.* 1s. 6d.
- Cyclopedia. Appleton's Annual—for 1876, a Record of the Day. New York. 8vo, illus. (Announcement.)
- Drawing. Technical Drawing and Design for Students of Architecture and Building. Part II: ornamental Drawing in elementary Designs, and detailed Examples of Architectural Designs in various Styles. London. 4to, illus. *Collins.* 1s. 6d.
- Electricity. Application of—, to Railway Working. W. Langdon. London. *Macmillan.* (*New York.* Announcement.)
- Elements of Magnetism and—. J. Angell. ed. London. 12mo, illus. *Collins.* 1s. 6d.
- Lessons in—at the Royal Institution, 1875-76. John Tyndall. London. 12mo, illus. (*Appletons, New York.*) \$1.00.
- Engineering. Manual of elementary Field—. (British Government Publication.) London. 8vo. 1s. 6d.
- Progress of civil and mechanical—and Shipbuilding. Ed. by Smith, Noble and Smith. Div. 1. London. 4to, illus. *Longmans.* 10s. 6d.
- Weisbach's Mechanics of—, Applied Mechanics, containing Strength of Materials, Arches, Foundations, Hydraulics, Steam Engine and other prime Movers, etc., transl. from the last German ed. New York. 8vo. *Wiley & Sons.* (Announcement.)
- Engineers, Information for colonial—. Ed. by J. T. Hurst. No. 2. Southern Africa,

- including Cape Colony, Natal and the Dutch Republics. Henry Hill. London. 8vo, illus. *Spona*. (New York.) \$1.50.
- Foliage, Art—for Sculpture and Decoration. Second Series. Jas. E. Colling. Part I. London. 4to, illus. (*Van Nostrand, New York*.) \$4.50.
- Force. What is Vital Force? or, a short and comprehensive Sketch, including vital Physics, Animal Morphology and Epidemics; to which is added an Appendix upon Geology, is the detrital Theory of Geology tenable? Richard F. Battye. London. 8vo. *Trubner*. 7s. 6d.
- Fossils, the American Paleozoic—. S. A. Miller. Cincinnati. 8vo. *Miller*. (Announcement.) \$3.00.
- Graphical Statics, Elements of—, and their Application to framed Structures, etc. Cranes; Bridge, Roof, and Suspension Trusses; Braced and Stone Arches; Pivot and Draw Spans; continuous Girders, etc. A. J. Du Bois. 2 vols. 2d ed., rev. and partly rewritten. New York. 8vo, illus. *Wiley & Sons*. \$5.00.
- Hand-Railing, Supplement to Lessons on— Robert Riddell. Philadelphia. 4to, illus. *Claxton, Remsen & Haffelfinger*. \$3.00.
- Hydro-Mechanics, a Treatise on—, W. H. Besant. 3d ed. 8vo. London. *Bell & Sons*. 10s. 6d.
- Iron and Steel, Strength and Determination of the Dimensions of Structures of —, with Reference to the latest Investigations; an elementary Appendix to all Text-Books upon Iron and Steel Construction. Jacob J. Weyrauch. Trans. by A. J. Du Bois. An Appendix by R. H. Thurston. New York. 8vo, illus. *Wiley & Sons*. \$1.00.
- Strength and Calculation of Dimensions of Iron and Steel Constructions, with Reference to latest Experiments. Trans. from the German of J. J. Weyrauch. by Mansfield Merriam. New York. 8vo, illus. *Van Nostrand*. \$1.00.
- Life on the Earth, the Succession of —, W. C. Williamson. (Manchester Science Lectures.) London. 12mo. *Macmillan*. (New York.) 6s.
- Machine Designs, the Elements of—, an Introduction to the Principles which determine the Arrangement and Proportions of the Parts of Machines, and a Collection of Rules for Machine Design. W. Cawthorne Unwin. (Text Books of Science.) London. 12mo. (*Van Nostrand, New York*.) \$1.50.
- Man, the Races of—, and their geographical Distribution, from the Germ of Oscar Peschel. New York. 12mo. *Appletons*. \$2.25.
- Manufacturing Industries, British—. Ed. by G. P. Bevan. Hosiery and Lace, by W. Felkin; Carpets, by Christopher Dresser; Dyeing and Bleaching, by T. Sims. 1 Vol. Pottery, by L. Arnoux; Glass and Silicates, by Prof. Barff. Furniture and Woodwork, by J. H. Pollen. 1 Vol. 2d ed. London. 12mo, illus. *Stanford*. (*Van Nostrand, New York*.) Each \$1.75.
- Maritime Warfare. Thomas G. Bowles. London. 8vo. *Ridgway*. 5s.
- Mechanic, the amateur—, a practical Handbook, describing the different Tools required in the Workshop, their Uses, and how to use Them; also Examples of different kinds of Work. Arthur H. G. Hobson. London. 12mo, illus. *Longmans*.
- Metal Work, illustrating the chief Processes of—, applied by the Goldsmith, Silversmith, Jeweller, and Art Workmen, in Brass, Copper, Iron, Steel, Bronze or other Metal. In 40 parts. Ed. by G. W. Yapp. Part I. London. 4to, illus. *Fitzee*. 1s.
- Microscope, a Course of practical Histology: being an Introduction to the Use of the Microscope. Edward Albert Schafer. (English Reprint.) Philadelphia. 12mo, illus. *Lea*. (Announcement.) \$2.00.
- Mining. Lectures on—delivered at the School of Mines, Paris, by J. Callon, trans. by C. L. Neve Foster and W. Galloway. 3 Vols. Vol. I. 8vo, Text. 4to Plates. London. *Dulau*. (*Van Nostrand, New York*.) \$13.00.
- Machinery. A Descriptive Treatise on the Machinery, Tools, and other Appliances used in Mining. George G. Andre. (To be completed in 12 monthly parts.) Part I. London. 4to, illus. *Spona*. (New York.) \$2.00.
- Natural Philosophy, a Course of—, R. Wormell. 5th ed. London. 12mo, illus. *Groombridge*.
- for Beginners, with numerous Examples. I. Todhunter. Part I. The Properties of Solid and Fluid Bodies. London. 16mo, illus. *Macmillan*. (New York.) \$1.50.
- Navigation; the Port of Refuge, or Advice and Instructions to the Master Mariner, &c. Manley Hopkins. 2d ed. London. 8vo. *Henry S. King*. 6s.
- Photography, a History and Handbook of —, trans. from the French by G. Tissandier. Ed. by J. Thomson. (English Reprint.) New York. 12mo, illus. (*Van Nostrand*.) \$2.50.
- Physical Geography, elementary Lessons in—. Archibald Geikie. 18mo, illus. *Macmillan*. (New York. Announcement.)
- Political Economy, Essay on—, Frederick Bastiat. English translation, rev., with Notes, by David A. Wells. New York. 12mo. *Fulwams*. \$1.25.
- Porcelain Painting, a Guide to—. S. T. Whiteford. London. 12mo, illus. *Rowney*. 2s. 6d.
- Sanitary. A Hand-book of Hygiene and Sanitary Science. George Wilson. 3d ed., enl. Philadelphia. 12mo. (*Van Nostrand, New York*.) \$3.50.
- Silver Coins of England arranged and described. E. Hawkins. 2d ed., with alterations and additions, by R. L. Kenyon. London. 8vo, illus. *Quaritch*. 36s.
- Sines, Haversines' natural and logarithmic —, used in Computing lunar Distances for the Nautical Almanac, ed. by Maj. Gen. Hannington. (British Government Publication.) London. 8vo. 21s.
- Slide Rule, Hand-Book of—, showing its Applicability to Arithmetic and Mensuration, with numerous Examples and useful Tables. W. H. Bayley. Rev. ed. London. 12mo. (*Van Nostrand, New York*.) \$2.50.
- Speculation. Descartes and English Speculation; the Influence of Descartes on metaphysical Speculation in England, being a Degree Thesis. W. Cunningham. London. 8vo. *Macmillan* (New York). \$3.00.
- Star Gazing: past and present. Lectures delivered at the Royal Institute by J. N. Lockyer, with Notes and Additions by G. M. Seabroke. London. 8vo, illus. *Macmillan* (New York. Announcement.)

Steam Engine, a few Notes on the portable —, with an Account of its Construction and general Adaptation. John Head. London. 8vo, illus. *Spons (New York)*. \$0.80.

—, a practical Treatise on the —, containing Plans and Arrangements of Details for fixed Steam Engines, with Essays on the Principles involved in Design and Construction. Arthur Rigg. (In 12 monthly Parts.) Parts I, II, III. London. 4to, illus. *Spons (New York)*. Each, \$1.25.

Telegraph Engineers, Journal of the Society of —, including original Communications on Telegraphy and Electrical Science. Ed. by Frank Bolton and J. Sivewright. Nos. 13, 14. London. 8vo, illus. *Spons (New York)*. \$2.00.

Wax Flowers, a Course of Lessons in Modeling —, designed for Beginners. Florence I. Duncan. Philadelphia. 12mo, illus. *Lippincott*. \$1.00.

Weighing and Measuring, the Science of —. H.W. Chisholm. (Nature Series). London. 12mo, illus. *Macmillan*. (New York. Announcement.)

Weaving, a practical Treatise on the Construction of the Loom and the Art of Weaving. Alex. Brown. rev. and enl. ed. London. 12mo, illus. (*Van Nostrand, New York*.) \$1.75.

Wire Ropes, Transmission of Power by —. Albert W. Stahl. (*Van Nostrand's Science Series*.) 18mo, illus. *Van Nostrand, New York*. \$0.50.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: regular meetings, when ballots for members will be canvassed and other business done, Wednesday, May 2d, June 6th, and July 4th; and stated meetings, for consideration of professional topics and enjoyment of social intercourse, Wednesday, May 16th and June 20th —each at 8 o'clock P.M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held May 2d, June 6th and July 4th, at 3 o'clock P.M.

PAPERS HAVE BEEN RECEIVED for presentation to the Society since the last announcement, as follows:

"Levees, as a System of reclaiming low Lands."

Discussion—J. F. Flagg. Feb. 13th, 1877.

"The simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fires."

Julius H. Streidinger—April 4, 1877.

"Failure of the Ashtabula Bridge."

Discussions—Squire Whipple, Alfred P. Boller. April . ., 1877.

PAPERS ON ENGINEERING SUBJECTS, giving results of practice, or in discussion of pertinent theoretical questions, are desired from members of the Society; their comments (whether or not present at meetings of the Society), upon papers published in Transactions, are solicited, and they are urged to contribute from note-books and other similar records, whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, Vol. I.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th, next. The conditions of award are set forth in the Code of Rules, herewith published; a copy will be furnished to members upon application.

ADDITIONS TO LIBRARY AND MUSEUM, to contain acknowledgments of contributions to the Library, through the Centennial Commission of the Society (referred to, in Transactions, Vol. VI, page 59), are again laid over, to appear in Proceedings for May.

THE ROOMS OF THE SOCIETY, after May 1st, will be at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park.

RATES OF POSTAGE on transient matter sent to the Society from domestic post-offices, except New York, are as follows:

On books, pamphlets, periodicals, maps and corrected proof sheets, one cent per two ounces; on photographs, lithographs, and engravings, one cent per ounce; and on letters and other mail matter, either wholly or partly in writing (except corrected proofs), sealed packages, or those wrapped so as not to be conveniently examined without destroying the wrapper, three cents per half ounce. The sender may write or print his address in or on a package, and state names and number of articles enclosed, without extra charge.

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DURHAM, C. WHEELER.....	Civil Eng., Chicago, Ill.....	April 4, 1877.
ENDICOTT, MORDECAI T.....	“ “ U. S. Navy, New London, Conn.....	“ “ “
GODWIN, BRYANT.....	Res. Eng., N. Y. State Canals, 551 Broadway, Albany, N. Y.....	“ “ “
HARDY, ARTHUR S. [A.]....	Prof. Civ. Eng., Chandler Sci. Dept., Dartmouth College, Hanover, N. H.	“ “ “
KNAPP, GEORGE O. [J.]....	Civil Eng., Hartford, Conn.....	“ “ “
MCDOWELL, NATHAN M....	City Eng., Alleghany City, Pa.....	“ “ “

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MOORE, JAMES.....	Sup't, C. R. R. of N. J., Elizabeth, N. J.
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READ, ROBERT L.....	Chief Eng., U. R.R., Transfer and Stock Yard Co., Indianapolis, Ind.
SEWALL, JOSEPH.....	City Eng., St. Paul, Minn.
SHEDD, J. HERBERT.....	65 Westminster st., Providence, R. I.
VAN WINKLE, EDGAR B....	“ Rockingham,” 56th st. and Broadway, New York.
WARD, CHARLES D.....	39 Hudson st., Jersey City, N. J.
WELLMAN, DAVID W.....	Civil Eng., St. Paul, Minn.

DEATHS.

GRAIN, WILLIAM.....	Fergus, Ontario.....	Jan. 10, 1877.
KIRKWOOD, JAMES P.....	Brooklyn, N. Y.....	April 22, “

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. May, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 24TH—26TH, 1877.—THE NINTH ANNUAL CONVENTION.—[Report of the proceedings has not yet come to hand.]

MAY 2D, 1877.—A quorum not being present, the regular meeting was adjourned.

MAY 11TH, 1877.—An adjourned regular meeting was held at eight o'clock P. M.

A paper by Edward P. North, C. E., of Fordham, N. Y., on "Brush Dams," was read by him and briefly discussed.

Mr. Charles E. Emery, Associate Secretary of the Ninth Annual Convention, held in New Orleans, made an informal report of the proceedings.

The death, on April 22d, of James P. Kirkwood, C. E., late of Brooklyn, N. Y., one of the first Members of the Society, a Director from its organization until November 6th, 1867, when he was elected President—the second incumbent of that office, which position he resigned June 16th, 1868, was announced, and it was moved that a committee be appointed to prepare a memoir of the life and professional services of the deceased.*

OF THE BOARD OF DIRECTION.

MAY 2D AND 11TH, 1877.—A quorum not being present, the stated meeting was adjourned.

* The Committee appointed, consists of Alfred W. Craven, Julius W. Adams, William E. Worthen and James B. Francis.

NOTES AND MEMORANDA.

REPORTS OF MEETINGS.

WATER SUPPLY FROM BRONX RIVER.—The following letter, written by Gen. Philip Schuyler, in answer to Col. Richard Varick, the Mayor of New York City, in the year 1799, asking him for his opinion on Dr. Brown's plan for supplying the city with water from the Bronx River, was presented by John Schuyler, C. E., of New York, and read at the meeting of the Society, April 18th, 1877. (It is printed as written.)

ALBANY, Jan. 29, 1799.

Dear Sir,

Mr. Briggs was so good as to deliver me two copies of Dr. Brown's Memoirs as from you.

I have read the Memoirs with as much attention as I am capable of.

Supposing the water of the Bronx sufficient for the purposes detailed in the Memoirs, the mode of conducting it to the City appears to me liable to such strong objections, that if I was a member of your corporation, or a director of an associate company engaged to convey that water to the City, I should not dare to venture on a plan so expensive, and so exposed, as I think, to danger.

Permit me, in confidence (for I wish not a contest with any person from whom I may differ in opinion), to mention some of the objections with which my mind is impressed.

The Doctor proposes, by means of a Hydraulic Machine, to raise the water to a height of 80 feet above the level of Harlem River, to gain a sufficient fall from thence to a reservoir at the city, and he estimated the fall so gained at 40 feet. This would, indeed, be the case if the tubes by which the water is conveyed could be so laid as to maintain a continual uninterrupted inclination from the Hydraulic Machine to the reservoir, but from the little I know of the intermediate country, it appears to me that the track of the aqueduct or tubes will pass thro' Ravines and over Hills whose summit level will be little short, if not exceed the difference of level between the 80 feet to which the water is to be raised, and the point where it is to be delivered. Let us suppose that the apex of such summit is only 10 feet below the level of the 80 feet to which the water is to be raised by the Hydraulic Machine, then it is perfectly evident that to such apex there would only be 10 feet fall from the Machine; and if such apex was four or five miles from the reser-

voir, a tube of six-inch bore, instead of delivering 300 000 Gallons per day, would not deliver more than one quarter that quantity; and if 300 000 Gallons be requisite, it would require four tubes of a six-inch bore; and, consequently, the expense would be greatly increased. But there may be several hills with intermediate valleys, and at the summit of each there must be an air-pipe to discharge the air which, entering the tubes with the water, will collect at such apex, and if not frequently discharged, will so wire-draw the water that little will pass. This will form a considerable item in the first expense, and be an annual one.

If the tubes in any intermediate valley should lay 70 or 80 feet below the height to which the water is raised by the Hydraulic Machine, the pressure on the tubes in those valleys will be so great as to require not only the very largest, but the most solid kind of timber to prevent their bursting. But it is hardly possible to guard against such accidents, as the London water-works amply evince; and so expensive is the charge of those repairs, that in that City they are in the practice of substituting iron cylinders, from time to time, as the wooden ones give way; indeed, the tubes which convey the water from the Chelsea Steam Engine to Hyde Park are all of cast iron.

If more than one string of tubes is indispensable, and even if they should not exceed two, yet the canal in which they must be laid would be nearly as wide as a canal to convey the whole of the water of the Bronx from the point where the Doctor proposes to take it to the reservoir in the City. Whether the water can be conveyed in an open canal or not, can only be determined by actual survey. If it could, I hesitate not to say, that it would be not only the most eligible, but probably, in the first instance, least expensive, and certainly not liable to such an annual heavy charge as must inevitably result from an Hydraulic Machine and subterraneous wooden tubes. But, should the first cost of an open canal be double that of Tubes, yet the certainty of supply and the trifling annual charge, would, in my estimation, render it incomparably more eligible than the other.

The Doctor has made an estimate of the expense. Estimates, nine times out of ten, are so erroneous, that I have little faith in any, even if previous surveys are made; but when

such surveys are not made, I reject them as erroneous. But why make estimates? The question is, is the work indispensable? If so it must be done be the cost what it may; only take care that it be done with proper economy and be well done. It will be so if Mr. Weston conducts the work. The corporation may insist on an estimate, he may give one; but if the work is to be performed in the manner proposed by the Doctor, and if Mr. Weston's estimate should not treble that of the Doctor's, I should conclude that his usual prudence had forsaken him. I mention this not to discourage the corporation from the attempt, but to guard them against setting their hopes beyond the bounds of probability, from which disappointment will always result.

Should it be found impracticable to convey the water of the Bronx to the City of New York, I do not think the idea of a supply from the "Colloc" or "Fresh Water Pond" ought to be abandoned, for if there should be a sufficiency there, the objections stated in the Doctor's memoirs to its use from the filth and drainings from vaults, might certainly be obviated by well-constructed embankments around the pond, with back drains to carry off extraneous water and filth, nor will it be at-

tended with any considerable expense to determine the quantity of water which the Pond will afford in twenty-four hours. The injury sustained by the distressing calamity with which your city has been recently afflicted, is not confined to the residents therein. It extends to and is felt in every part of the State. Impressed as I am with this truth, and convinced that Legislative aid should be interposed, to prevent, if possible, a repetition of such distress, I have most earnestly recommended to many of the Legislature to appropriate the duty on "Vendues" to this object and to the relief of your City from its heavy burdens. But my hopes on this head are slender, as the members of the Legislature do not seem to have duly appreciated the extent of the injury which the State sustains from any calamity in the Metropolis.

I therefore wish that some able pen should state it in detail, and publish it in the papers printed in this City, to draw the attention of the Legislature.

I am, dear sir, with
great regard and esteem,
your obedient servant.
PH. SCHUYLER.

RICHARD VARICK, Esq.

THE CENTENNIAL COMMISSION OF THE SOCIETY.

REPORT ON AWARDS.—The following certificate, duly signed and sealed, has been received from the International Exhibition;

"The United States Centennial Commission has examined the reports of the Judges, and accepted the following reasons, and decreed an award in conformity therewith."

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"American Society of Civil Engineers, New York."

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From Civil Engineers Club of the North West. Chicago, Ill.:
Deep pile Driving in Wisconsin, 1875.

Preliminary Surveys for Texas & Pacific Railway, 1874.

From H. W. Clarke, Syracuse, N. Y.
Report of Superintendent of Onondaga Salt Springs. Albany. 1877.

From Claxton, Remsen & Haffelfinger, Philadelphia:

Civil Engineer's Pocket Book. J. C. Trautwine. Rev. ed. Philadelphia.

From Mrs. C. Collins, Cleveland, O.:
Photographs illustrating Bridges and Structures.

tures on the Lake Shore & Michigan Southern Railway, in bound Portfolio.

From J. J. R. Croes: Department of Public Parks. Report of the civil and topographical Engineer and the Landscape Architect, accompanying a Plan for local Steam Transit Routes in the 23d and 24th Wards, New York. (Copies for distribution.)

From C. Davis, Alleghany City, Pa.: Annual Report of the City Engineer of Alleghany City. 1873.

From J. P. Davis, Boston, Mass.: Annual Report of the City Engineer of Boston for 1876. Boston.

From C. T. Flowers, Columbus, O.: Report of Joint Committee on the Ashtabula Bridge Disaster. Columbus. (Also copies from others unknown.)

From C. G. Forshey, New Orleans, La.: The Route to the Seaboard, the Mississippi River against transcontinental Railroads. New Orleans.

From C. Douglas Fox, London: Address by James Ashbury, on the Eastern Question, at Brighton. January 30, 1877.

From J. P. Gardner, Albany, N. Y.: Report of Board of Commissioners of the State Survey for 1876. (Several copies.)

From Gen. G. A. Gillmore, New York: Foundation of the Washington National Monument. (Eight copies.)

From C. O. Gleim, Cologne, Germany: Rhenish Railroad Bridge over the Rhine at Rhemshausen. (German.)

From H. S. Goodwin, Bethlehem, Pa.: Annual Report of Lehigh Valley R. R. Co., January 16, 1877. Philadelphia.

From G. S. Greene, Jr., New York: Facts relating to Department of Docks, City of New York, and Reasons for its Continuance as a separate Department of city Government. New York. (2 copies.)

Review by the Dock Commission, of reports made to certain commercial Bodies. New York. (2 copies.)

From I. Ad. Helmeccourt, New Orleans: Project of a Ship Canal between Mississippi River and Gulf of Mexico. 2 vols. New Orleans.

From D. F. Henry, Detroit, Mich.: Annual Report of Board of Water Commissioners, Detroit, with Reports of Officers for 1876. (3 copies.)

From Prof. J. Henry, Director Smithsonian Institute, Washington, D. C.: Smithsonian Report for 1875. Washington.

From G. Hornung, Newport, Ky.: Annual Reports submitted to Board of Councilmen of Newport, Ky., for 1876.

From Gen. A. A. Humphreys, Chief of Engineers, U. S. A., Washington: Annual Report of Chief of Engineers for year 1876. 3 vols.

Proposals for Building Dam on the Great Kanawha River. W. P. Craighill. Reports on the following. (Several copies.)

Destruction of Reef at Hallet's Point. John Newton.

Harbor of Refuge at Mill Creek on the Ohio River.

Improvement of the Ohio, Monongahela and Wabash Rivers.

Improvement of the South Pass of the Mississippi River. (Sixth report).

Improvement of Rivers and Harbors in California.

Reconnaissance from Carroll, Montana Territory, to Yellowstone Park and return. W. Ludlow.

Water Line of Transportation from Mouth of St. Mary's River to the Gulf of Mexico. Q. A. Gillmore.

Specifications for Improvement of Rappahannock River. Va.

Statement from Secretary of War concerning Appropriations for Improvement of Rivers and Harbors.

Suggestion relating to Acts for Improvement of Fox and Wisconsin Rivers. D. C. Houston.

From Institution of Civil Engineers, London, England:

Excerpts from Minutes of Proceedings, Session 1876-7, as follows:

Abstracts of Papers in foreign Transactions and Periodicals. (2 numbers).

Chalk Water System. Joseph Lucas. With Abstract of Discussion.

Combustion of refuse vegetable Substances, as straw, Cotton, Stalks and Brushwood, under Steam Boilers. John Head. With Abstract of Discussion.

Conditions of Resistances of Swing Bridges. Jules Gaudard.

History and theoretical Laws of centrifugal Pumps, as supported by Experiment, and their Application to their Design. R. C. Parsons.

Repairs and Renewals of Locomotives. A. McDonnell. With Abstract of Discussion.

The Sewage Question. C. A. Bazalgette.

Minutes of Proceedings, with other selected and abstracted Papers. Session 1876-7. Part I.

From Institution of Mechanical Engineers, Birmingham:

General Index, &c., Proceedings 1847-73.

Library Catalogue, 1876.

Proceedings, October, 1876; January, 1877. (2 numbers.)

From Iron and Steel Institute, London: Journal of the Institute, Proceedings of Leeds Meeting, 1876.

From Capt. W. A. Jeffers, Chief of Ordnance, Bureau U. S. N., Washington: Report of Chief of Ordnance, 1876.

From J. Kennedy, Montreal, Can.: Annual Report of Harbor Commissioners of Montreal for 1876. Montreal.

From G. A. Kimball, Somerville, Mass.:

Third Annual Report of the City Engineer of Somerville.

From L. H. Knapp, Buffalo, N. Y.: Eighth Annual Report of Buffalo City Water Works for 1876.

From C. Latimer, Cleveland, O.: Meeting of Road Masters of Atlantic & Great Western R. R., October 26, 1876.

From G. P. Low, Jr., Boston, Mass.: Duty of Pumping Engines. New York.

Reports as follows:

Of Chief and Consulting Engineer of the Board of Public Works, Jersey City, 1871.

Of Chief Engineer of Jersey City, 1872.

Of Commissioners of City Works, City of Brooklyn, for 1872.

Of Nassau Water Department, City of Brooklyn, for 1869 and 1871. (2 numbers).

Of Newark Aqueduct Board, 1870.

From Emil Low, Pittsburg, Pa. :
Pittsburg Water Works. Map showing Location of Hilland Avenue, Brilliant Hill Reservoirs and the Pumping Works.

From E. Malezieux, Paris, France :
Maritime Ports of France (French). 8vo, Text with Maps. Paris.

From C. C. Martin, W. H. Paine, F. Collingwood and G. W. McNulty, Brooklyn, N. Y. :
Report of Chief Engineer of New York & Brooklyn Bridge, January, 1877. (A copy for each member).

From W. J. McAlpine, Babylon, N. Y. :
Brief History of Petroleum. (6 copies.)
Reports, bound in 8 volumes, as follows ;
Canada—Canals, Public Works, 1855-1873.
Canals, team-power, Gates, Canada & Western Canal.
European Engineers.
Jetties and Levees, Hartley, U. S. Engineers, Eads.
Pumping Engines, Ordnance, Miscellaneous. 1876.
Sewerage, Sanitary Engineering. 1876.
Water Works, Philadelphia, Reports of W. J. McAlpine.
Water Works. 1876.

From W. Metcalf, Pittsburgh, Pa. :
On the Relationship of Structure, Density, and chemical Composition of Steel. (3 copies).

From John Nader, St. Paul, Min. :
Transactions of Wisconsin Academy of Sciences, Arts and Letters, 1875, 1876. Vol. III.

From Charles Paine, Cleveland, Ohio :
Seventh Annual Report of Lake Shore & Michigan Southern Railway Co. 1877.

Meeting of Officers and Employees of Lake Shore & Michigan Southern Railway Co., on Death of Charles Collins, late Chief Engineer, 1877.

State Railroad.—Account rendered of Operations during 1868. Reports presented to the Legislative Chambers by the Minister of Public Roads. Brussels. (French.)

Supreme Court of the United States, November, 1876. Michigan Southern & Northern Indiana R. R. Appellant. Brief for Appellant. Chicago.

From W. H. Paine, Brooklyn, N. Y. :
Niagara Railway Suspension Bridge.

From G. W. Plympton, Brooklyn :
Report of Minister of Public Works for year ending June 30, 1876. Ottawa.

From T. Prosser & Son, New York :
The International Exhibition, Philadelphia, 1876. Cast-Steel Works of Fried. Krupp, Essen, Germany. French and Spanish. (4 copies.)

Profiles of Rails made. Plates showing Specifications of Work done. 2 volumes.

From W. Rotch, Fall River, Mass. :
Annual Report of Water Board of City of Fall River. January, 1877.

From F. Rziha, Vienna, Austria.
Construction of Rails and Railroad Superstructure. (German). Vienna.

From C. P. Sandberg, London :
Description of Standard Rail Sections. Appendix No. 1. London)

From Admiral B. F. Sands, Superintendent U. S. Naval Observatory, Washington, D. C. :

Astronomical and meteorological Observations made during 1874, at U. S. Naval Observatory.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows : regular meetings, when ballots for members will be canvassed and other business done, Wednesday, June 6th and July 4th; and a stated meeting, for consideration of professional topics and enjoyment of social intercourse, Wednesday, June 20th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held June 6th, July 4th and August 1st, at 3 o'clock P. M.

No regular or stated meetings of the Society will be held from July 4th to September 5th.

ADDITIONS TO LIBRARY AND MUSEUM. Acknowledgments of contributions to the Library, through the Centennial Commission of the Society are again unavoidably laid over.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Ramercy Park.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th next. The prescribed conditions are set forth in the Code of Rules herewith published; a copy will be furnished upon application.

No award having been made last year, it is announced that, under Rule VI, two premiums are offered for the coming year, one being a gold medal for the best paper, and the other, books (costing \$70 currency), for the second best paper, competing for the award.

INFORMATION IS WANTED OF JOHN CRUISE, C. E., a native of Ireland, graduate of Old Trinity College, who was on the Great Western Railway of England under Mr. Brunel; in 1856 he was engaged in surveying town sites along the Hannibal & St. Joseph Railroad, was previously upon location of this road, on what was then known as the Terre Haute & Richmond Railroad, and on the Ohio & Mississippi, Missouri Pacific and other railroads. Particulars may be sent the Secretary.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III, June, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 24TH—30TH, 1877.—THE NINTH ANNUAL CONVENTION of the Society was held at New Orleans, April 24th and 25th, followed by a visit to the harbor protection boat, the ice manufactories, steam cotton presses and drainage works of the city, April 26th; an excursion to the jetties at the mouth of the Mississippi (stopping at Magnolia plantation), April 27th and 28th, and an inspection of the Bonét Carre crevasse, April 30th.^a

The following members and guests of the Boston Society of Civil Engineers, of the Civil Engineers' Club of the Northwest, of the Civil Engineers' Society of St. Louis and of this Society, were in attendance.

Alfred L. Rives of Mobile, Ala.; Charles A. Ferry and Albert B. Hill of New Haven and Mordecai T. Endicott of New London, Conn.; Edmund L. DuBarry and David E. McComb of Washington, D. C.; Frederick W. Clarke, A. Comstock, L. E. Cooley, George H. Frost, W. F. Goodhue, O. B. Greene, Max Hjortzberg, R. J. McClure, George C. Morgan, William H. Newton, L. S. Olmstead, E. Powell, Willard A. Smith and John H. Thomas of Chicago and William Sooy Smith of Maywood, Ill.; Lorenzo M. Johnson of Keokuk, Ia.; William R. Belknap, Albert Fink, Henry Fink, Frederick de Funiak, Frederick W. Merz and Frederick W. Vaughan of Louisville and John E. Earley of Somerset, Ky.; James A.

(a.) Full reports of the Convention have not yet come to hand; when received, the more important matter will appear under "Reports of Meetings."

Andrews, P. G. T. Beauregard, G. L. Blanchard, Charles H. Boyd, Elmer L. Corthell, Charles L. B. Davis, Caleb G. Forshey, Leon Fremaux, James Freret, Edward D. Frost, James H. Gardner, Thomas S. Hardee, Benjamin M. Harrod, G. Allon de Hemecourt, J. A. de Hemecourt, Charles W. Howell, W. J. Karner, Benjamin McLeran, E. P. Robinson, M. Rogers and Arthur J. Wrotnowski of New Orleans, La.; C. Frank Allen, Frederick Brooks, S. Clarence Ellis, Clemens Herschel, Arthur Hobart, Edward S. Philbrick, William Watson, Frank O. Whitney and Henry M. Wightman of Boston, Desmond Fitzgerald of Brookline, William Rotch of Fall River, Oliver E. Cushing, James B. Francis and A. S. Tyler of Lowell, Emory C. Davis of Northampton and David W. Cunningham of South Framingham, Mass.; H. P. Davock and Alfred Noble of Detroit, Mich.; Francis U. Farquhar, Joseph S. Sewell and Horace E. Stevens of St. Paul, Minn.; Niles Meriwether of McComb City and C. M. Perin of Ocean Springs, Miss.; William B. Cogswell of Mine La Motte, Philip N. Moore and Robert Moore of St. Louis, Mo.; Robert Fletcher of Hanover, N. H.; Charles B. Brush and Arthur Spielmann, of Hoboken, Charles D. Ward of Jersey City and William E. Kelly of New Brunswick, N. J.; John Bogart, Charles E. Emery, Charles R. Flint, Charles M. Harris, Sanford Horton, Thomas J. Long, Arthur Macy, George S. Morison, W. Milnor Roberts, William H. Wiley and William E. Worthen of New York, William H. Searles of Rochester, James P. Gould of Rondout and Horatio Seymour, Jr. of Utica, N. Y.; L. G. F. Bouscaren, Henry Earnshaw and Thomas D. Lovett of Cincinnati, Benjamin F. Morse and Charles H. Strong of Cleveland, O.; Edmund A. Doane and J. Foster Flagg of Meadville, Adolphus Bonzano and John Griffen of Phoenixville, Sidney T. Fuller, Franklin C. Prindle and Frank H. Taylor of Philadelphia, James Archbald of Scranton and Arthur Beardsley of Swarthmore, Pa.; Robert L. Engle and Samuel Whinery of Chattanooga, William H. H. Benyaurd and Owen Meriwether of Memphis, and Wilbur F. Foster and Eugene C. Lewis of Nashville, Tenn.; James A. Hayward of Galveston and Milton G. Howe of Houston, Texas, and Charles McRitchie of Milwaukee, Wis.

The several sessions of the Convention, for the consideration of professional subjects and the transaction of regular business, were held at the Chamber of Commerce, April 24th and 25th, and the Convention dinner was had at Milneburgh, on Lake Pontchartrain, on the evening of April 26th.

THE FIRST SESSION was called to order Tuesday, April 24th, at 10 o'clock, A. M. by John Bogart, Treasurer of the Society. He introduced W. Milnor Roberts, Director and Past Vice-President, who made an opening address,^b and on motion, Caleb G. Forshey was declared Chairman of all but the business sessions of the Convention, John Bogart, Secretary, and Charles E. Emery, Associate Secretary.

(b.) See—Reports of Meetings, July Proceedings.

The following were presented :

From the Council of the City of New Orleans—March 27th, 1877:

"Whereas, information has reached this Council that a Convention of the most prominent civil engineers in the United States is to be held in this city on April 24th next, therefore be it—

"Resolved, that the hospitalities of the city be and are hereby extended to the members of said Convention, and that a committee be appointed, to consist of the Mayor, Administrator of Water Works and the City Surveyor to make suitable arrangements in carrying out the intention of this resolution."

From the Committee of the Council so appointed ; April 16th, 1877:

"Resolved, that the Committee * * * tender in behalf of the City Council, the use of its chamber to the American Society of Civil Engineers for holding its sessions, while in the City of New Orleans."

On motion, a committee of the Convention was appointed to thank the city authorities for these courtesies, and to tender them an invitation to attend the Convention and take part in its deliberations. The committee, in due course, reported that such had been done, and the invitation accepted by the Mayor.

A record of those in attendance was then taken.

An invitation from the Barataria Ship Canal Company, recently chartered by the Louisiana Legislature, for the purpose of securing a permanent ship canal from the Mississippi River to the Gulf of Mexico, to join in a proposed inspection of the route selected, on May 1st, was received and accepted in behalf of such members of the Convention as then would be able to attend.

The order of business, as previously announced in Proceedings^c and by circular, was taken up ; the topics as specified, to be named for discussion in regular order.

The consideration of professional subjects was entered upon, and the first topic—"Bridges," called ; under it discussions on "The Failure of the Ashtabula Bridge,"^d by Robert Briggs, Thomas C. Clarke, Theodore Cooper, Charles Hilton and C. Shaler Smith were read. An incomplete copy of the Report of Joint Committee of Ohio Legislature on the Ashtabula Bridge Disaster, was presented, and further discussion was had, by William H. Searles, William Rotch, Clemens Herschel, Edward S. Philbrick and others present.

The following resolutions, the first embodied in the paper of C. Shaler Smith, and the second offered by Clemens Herschel, were considered and referred to the regular meeting of the Society to be held during the Convention:

First.—Resolved, that a committee of five, whose names shall be selected by letter ballot, shall be appointed to draft a law covering the points outlined on pages 125, 126, 127, 128, Transactions,^e May, 1875,

(c.) Page 22. (d.) Referring to—CXXXVII, The Failure of the Ashtabula Bridge. C. Macdonald. Transactions, Vol. VI, page 74. (e.) Vol. IV.

adding thereto the necessary provisions to secure the inspection by experts of all questionable bridges now in existence.

And further, that this law so drafted shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to the Society for letter ballot, and if approved, that printed copies of the said law and the accompanying resolution be sent to the members of the Society, with a request that they move actively, each in his own State, towards procuring the passage of the specified law by the various State Legislatures during the coming winter.

Second.—Resolved, that a committee of five, whose names shall be selected by letter ballot, shall be appointed to draft a law requiring tests of finished bridges before, and at stated times after, their opening for public travel.

And further, that this law so drafted shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to this Society for letter ballot, and if approved, that printed copies of the said law and the accompanying resolution be sent to the members of the Society, with a request that they move actively, each in his own State, toward procuring the passage of the specified law by the various State Legislatures during their next session.

A paper by Charles E. Emery, on the "Relative Quantities of Material in Bridges of different Kinds and of various Heights," was read by the writer, and discussed by W. Sooy Smith, Edward S. Philbrick, John Griffin, Clemens Herschel, J. Foster Flagg and L. G. F. Bouscaren.

The second topic—"Hydraulics" was called: under it, a paper by Charles W. Howell, on the "Improvement of Entrance to Galveston Harbor," was read. The subject of harbor improvements was referred to, and discussion followed.

A paper by Theodore G. Ellis, on the "Flow of Water in open Channels" was read; remarks upon it were made by James B. Francis. Elmer L. Corthell made statement of the present condition of the works and what is proposed to be done, for the improvement of the mouths of the Mississippi; the paper by Caleb G. Forshey on "Cut-offs of the Mississippi River, their effect on the Channel, above and below," already published,^f was referred to, and a discussion by Prof. Forshey and others, followed.

A paper by William H. Searles, giving "Results of recent delicate Test Levels upon the Line of the Erie Canal," was read by the writer, and Elmer L. Corthell gave "Details of the Method of Determining the Slope of the Mississippi River, from New Orleans to the Gulf."

A paper by J. Foster Flagg, on the "Efficiency of Steam Vacuum Pumps,"^g was discussed by the writer, Charles E. Emery and William E. Worthen.

(f.) Referring to—CXXVI, Cut-offs in the Mississippi River, their Effect on the Channel above and below. C. G. Forshey. Transactions, Vol. V, page 317.

(g.) Referring to—CXXX, Efficiency of Steam Vacuum Pumps. Transactions, Vol. V, page 382.

The committee on "Gauging of Streams," J. James R. Croes, Chairman, was continued.

The Convention adjourned to meet at 7 o'clock, p. m.

THE SECOND SESSION was called to order at 7 o'clock, p. m.

A reply, by the late George W. R. Bayley, of New Orleans, to discussion of his paper on "Levees,"^a was read.

A report, as follows, of Committee on the Metric System of Weights and Measures was presented :

"The committee appointed to report to the Society a form of memorial to Congress, in furtherance of the adoption of the metric standards in the Office of Weights and Measures at Washington, as the sole authorized standards of weights and measures in the United States, respectfully submit the following draft :

"To the Honorable, the Senate and the House of Representatives of the United States, in Congress assembled :

"The memorial of the American Society of Civil Engineers respectfully sheweth :

"That the opinion is widely received that the metric system will eventually supersede the confusion of weights and measures, now in common use.

"That a desire for the proposed reform has been manifested among our people, especially among corporate bodies of physicians, druggists, teachers, architects, engineers and men of science, and that they may be expected to co-operate cordially, whenever Congress shall initiate a movement for the general adoption of the metric system.

"That the action of the United States government, whose relations with many of our industries are very extensive, must have a great, if not a decisive influence throughout the community.

"The prayer of your memorialist, therefore, is that your honorable body may enact, that in every publication, report, advertisement and other official document issued by any department of the United States government, *only* the metric system of weights and measures shall be used, on and after such date as your honorable body may deem the most advisable."

Clemens Herschel, Chairman of the Committee, offered the following to be submitted to letter ballot :

"Resolved, that the form of memorial submitted, be adopted by the Society, be signed by the President and Secretary and transmitted to the two Houses of Congress."

The following, offered by Theodore G. Ellis, of Hartford, Conn., was also submitted :

(A.) Referring to—CXXI. *Levees as a System of reclaiming Low Lands.* G. W. R. Bayley, Transactions, Vol. V, page 115.

Resolved, that a committee of five be appointed by the President, to consider and report upon what is the best system of weights and measures, for the use of engineers in the United States; that this committee have power to confer with committees from other societies for a like purpose, and that the foregoing be submitted to this Society, to be acted upon by letter ballot.

Upon separate motions, these resolutions were referred to the regular meeting of the Society, to be held during the Convention.

A paper by W. Milnor Roberts, on the "American Society of Civil Engineers, and its Future," and a memoir by Caleb G. Forshey, of the professional life and services of the late George W. R. Bayley, a Member of the Society, who died December 14th, 1876, were read.

The Convention adjourned to meet Wednesday, April 25th, at 10 o'clock A. M.

THE THIRD SESSION was called to order Wednesday, April 25th, at 10 o'clock A. M.

Elmer L. Corthell, for Resident Committee on Ninth Annual Convention, announced arrangements for excursions about the city on Thursday, and to the jetties on Friday.

J. A. de Hemecourt presented to the Society a memoir (in print), with charts, of a passage to the Gulf of Mexico, proposed by Gen. Buisson, in 1830.

The third topic, "Masonry," was called; and the Committee on "Nomenclature and Classification of Masonry," J. James R. Croes, Chairman, was continued.

The fourth topic "Railroads," was called; and the Committees on "Uniform Accounts and Returns of Railroad Companies," and on "Resistances of Railway Trains," William P. Shinn, Chairman, were continued.

The fifth topic, "Strength of Materials," was called, under it a report of Committee on "Tests of American Iron and Steel," was presented by W. Sooy Smith, Chairman, and discussed by him, Charles E. Emery, F. U. Farquhar and others.

It was moved, that a committee be appointed to prepare and present to the Convention, some form of definite action upon the subject of Tests of American Iron and Steel. John Griffen, Louis G. F. Bouscaren and Edward S. Philbrick, were appointed such committee, which subsequently made the following report, and it was adopted.

"Whereas, in 1872, a committee of members of the American Society of Civil Engineers was appointed to take into account and to ascertain the best way of establishing a Board for the testing of such metals and alloys as form parts of the structures and machines required for use by the citizens of this country; and—

"Whereas, under this appointment, the committee proceeded in its labors so far as to obtain favorable action from the Congress of the United

States, by a law authorizing the creation of a Board for the purpose of making such tests, and appropriating money to be expended therefor as well as in purchase of suitable machinery ; and—

“Whereas, at a late session of Congress a law was passed,ⁱ whereby said Board would cease to exist upon the expenditure of the money then appropriated ; be it—

“Resolved, that this Society deems the tests proposed to be made, to be of national importance, and therefore asks that so much of the Sundry Civil Appropriation Bill, passed by Congress, as provides that the Board to test Iron, Steel, and other Metals, shall be discontinued when the money appropriated for its use shall have been expended, be repealed ; that the unexpended balance to the credit of the Board be re-appropriated, and that such further appropriation be made for the use of the Board as may be needed to complete the investigations undertaken—the sum required for the coming year being \$40 000.

“Resolved, that each member of this Society be urged to use such influence as he may possess, to obtain favorable and immediate action by the Congress of the United States in furtherance of the objects here prayed for.

“Resolved, That the above resolutions be printed, and several copies furnished to each member of this Society, to be used by him in promoting the object sought ; and that reports of their action in the matter be made by each to the Secretary, giving names of representatives in Congress who have been addressed or seen on the subject.”

The papers *j* on “Qualities of Iron and Steel,” and on the “Rate of Set in Metals, subjected to Strain for considerable Periods of Time,” were discussed.

The Convention then adjourned to hold a regular meeting of the Society.

THE FOURTH SESSION of the Convention was held as a regular meeting of the Society, for the transaction of regular business.

On motion, W. Milnor Roberts was appointed President, *pro tempore*, and John Bogart, Secretary.

A report of the Centennial Commission of the Society, Theodore G. Ellis, Chairman, and one of the Committee on Quarters for the Society, John Bogart, Chairman, were presented and filed, and the Commission and Committee continued.

The amendment of the By-Laws, proposed by J. James R. Croes, and seconded by Edward P. North, at regular meeting of the Society, April 4th,^k was taken up, considered, and unanimously adopted.

The following amendments of the organic law of the Society were presented and considered :

(i.) Vol. II, page 100. (j.) Referring to—CXXXVIII, Qualities of Iron and Steel. W. Metcalf. Transactions, Vol. V, page 323 ; and to CXXXIV, Rate of Set in Metals subjected to Strain for considerable Periods of Time. R. H. Thurston. Transactions, Vol. V, page 28. (k) See page 28.

10. Amendments to the Constitution, proposed by G. Leverich, and duly seconded.

ARTICLE XIX.—For “two” insert “five,” and for “thirty” insert “twenty-five.” The article will then read :

All candidates for admission to the Society must file statements, by themselves, setting forth the grounds of their claim to be elected ; be proposed by at least *five* members of the Society, to whom they must be personally known, and a notification of the same sent to each member whose address is on record. Each proposition, with the names of the proposers, must be posted in some conspicuous place in the rooms of the Society for at least *twenty-five* days before being submitted to vote. All papers and applications shall be laid before the Board of Direction, and be reported upon, previous to action by the Society.

ARTICLE XX.—For “thirty” insert “twenty-five,” and for last clause insert as below. The article will then read :

In elections for membership, of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after *twenty-five* days have elapsed from the time of mailing the notification. Negative ballots exceeding five per cent. of the total number canvassed shall exclude.

ARTICLE —. (A new article) :—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, or who from ill health, advanced age, or other good reason assigned, has a scanty income ; and the Board may remit the whole or part of assessments in arrears, or accept in lieu thereof, desirable additions to the Library and Museum.

ARTICLE —. (A new article) :—Upon the written request of ten or more Members that, for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and, if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him and present a written defence. Two months after such advice was given, the Board of Direction shall finally consider the case, and, if resignation has not been tendered, or a satisfactory defence made, may then expel the accused. Such action shall be stated to him and the Society, and this shall be in any event the only public announcement of the matter.

ARTICLE XXII. (To read) :—Persons thus elected and duly qualified, who reside within fifty miles of the post-office in the City of New York, shall be deemed Resident ; and those who reside beyond this limit shall be deemed Non-Resident. The membership of any person shall begin on the day of his election.

ARTICLE XXIX. (To read) :—Members, who become Residents or Non-Residents by removal into or beyond the limits prescribed in Article XXII, shall be subject to assessments in the class in which they were

on the day of the Annual Meeting, as may appear upon records of the Society or by written notice to the Secretary.

2°. Amendment to the By-Laws, proposed by G. Leverich, and duly seconded.

SECTION 32. (To read):—Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the Members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast, shall be necessary for the adoption of any such addition or amendment.

3°. Amendment to the Constitution, proposed by W. Sooy Smith, and duly seconded.

ARTICLE—Upon the written request of ten or more Members, that for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given, the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defence made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall, in any event, be the only public announcement of the matter.

4°. Amendment to Article XX of the Constitution, proposed by Francis H. Farquhar, and duly seconded.

For "three," insert "five;" the Article will then read:

ARTICLE XX.—In elections for membership of either class, members shall vote by letter or by ballot, in the usual way, and the result shall be announced at the next regular meeting held after thirty days have elapsed from the time of mailing the notification. *Five* or more ballots cast in the negative shall exclude. Members notified, but not responding, shall be classed as voting in the affirmative.

5°. Amendment to same Article, proposed by Charles H. Strong, and duly seconded.

For "three," insert "ten;" the Article, otherwise, will read as the preceding.

The following were considered and severally referred to the Board of Direction, to be submitted to the Society, and a letter ballot to be taken upon each.

1°. Moved by W. Sooy Smith, and duly seconded.

Resolved, that the reading of engineering subjects shall not form part of the proceedings of the Society at the regular meetings held during its

Annual Conventions ; and that special meetings, for the purpose of hearing and discussing such papers, may be held during the Conventions only when authorized by a two-thirds vote of members of the Society present at one of the sessions of the Convention.

20. Moved by Caleb G. Forshey, and duly seconded.

Resolved, that the Conventions of the Society be divided into three sections, and that the professional papers be read before the several sections, as they may be appropriate ; that the Convention shall adjourn from time to time, to give sections time for their meetings ; and that the members, writing papers be required to indicate to what sections they pertain.

The following, previously considered in Convention and referred to this regular meeting, were also severally referred to the Board of Direction, to be submitted to the Society, a letter ballot to be taken upon each : the resolutions offered in the first session, one by C. Shaler Smith, and one by Clemens Herschel, relating to inspection of bridges ; and the resolutions offered in the second session, one by Clemens Herschel, and one by Theodore G. Ellis, relating to a system of weights and measures.

The following, presented by Charles E. Emery, and duly seconded, was adopted :

Whereas, the metric system of weights and measures is now extensively used abroad ; and whereas, it is desirable that the relation of the merits of differing systems be made familiar to all, by comparison ;

Resolved, that members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

Resolved, that the Secretary of the Society be requested to maintain a standing notice of the above in the regular publications of the Society.

The time and place of the next Annual Convention were considered.

The Society then adjourned to again meet in Convention.

THE FIFTH SESSION of the Convention was then called to order.

Under amendment to By-laws, adopted at the regular meeting, the following were appointed a Nominating Committee : William E. Worthen, W. Sooy Smith, Frederick de Funiak, Joseph M. Wilson and Caleb G. Forshey.

James B. Francis was, for the time, called to the Chair, and a paper by Caleb G. Forshey on " Patents and Patent Laws, Inventions, Inventors and Authors " was read. Mr. Forshey resumed the Chair.

A paper by Thomas S. Hardee, on a " Novel Method of Railroad Survey," was read ; a discussion by William H. Searles and the writer followed.

L. G. F. Bouscaren gave a description, illustrated with drawings, of the recent tests of the new iron bridge over the Kentucky river, on line of the Cincinnati Southern Railway.

It was moved that the thanks of the Convention were due to the Chairman and Secretaries.

The following was adopted :

Whereas, the members of this Society—many traveling great distances—have received admirable and valuable facilities and courtesies in coming to and returning from this Annual Convention, held in New Orleans, and also during their stay in the city, from the officers of a number of railroad companies and from others, which are highly appreciated by the Society ; it is therefore—

Resolved, that the Secretary be requested to convey, at the earliest moment practicable, to each officer, or other person entitled thereto, the thanks of the Society for their courtesies.

The Convention finally adjourned.

MAY 16th, 1877.—A quorum not being present, no stated meeting was held.

JUNE 6th, 1877.—A regular meeting was held at 8 o'clock P. M.

The President made report for the Board of Direction of action taken to perfect the incorporation of the Society, which was approved and the action formally ratified.

Announcement was made, of appointment of Alfred W. Craven, Julius W. Adams, William E. Worthen, James B. Francis, and the President, as committee to prepare a memoir of the life and professional services of James P. Kirkwood, deceased.

The following was referred to the Centennial Commission, with instructions to report at the next regular meeting :

Whereas, it is proposed to have an exposition of the arts and industries of all nations in Paris during the coming year ; in view of the fact that foreign engineers and others engaged in constructions were greatly interested in the exhibition of the growth and present state of American engineering made at Philadelphia under the auspices of the Centennial Commission of this Society ; and that such interest may be renewed and increased by a similar exhibition in Paris, it is

Resolved, that the Centennial Commission of this Society be charged with the matter, with power to fill vacancies, to appoint sub-committees, and to arrange for the exhibition of plans, models, and specimens showing the progress in this country of engineering in its several branches, substantially as was done in Philadelphia ; the same to be without expenditure from any of the regular funds of the Society.

The first Wednesday in July being Independence Day, the next regular meeting was postponed to Thursday, July 12th.

OF THE BOARD OF DIRECTION.

MAY 21st, 1877.—An adjourned meeting was held at 4 o'clock P. M.

The Committee to perfect the incorporation of the Society made a report, which was accepted, and the action taken was formally ratified and completed.

There having been no award of the Norman Medal the past year, announcement was authorized,* that a premium, to consist of books, to cost \$70, currency, is offered for the second best paper competing for the Medal this year.

MAY 23D, 1877.—Adjourned meeting for consideration of applications for admission to the Society, was held at 3 o'clock P. M.

JUNE 6TH, 1877.—In absence of a quorum, the stated meeting was not held.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Algebra, Rules and Examples in —. Part I. T. Dalton. London. 18mo. *Macmillan*, (New York). \$1.25.
- Alkali Trade, the History, Products and Processes of —, including the most recent Improvements. Chas. Thos. Kingzett. London. 8vo, illus. (*Van Nostrand, New York*.) \$6.00.
- Animal Products: their Preparation, commercial Uses, and Value. (South Kensington Hand-book.) London. 12mo. *Chapman & Hall*. (*Scribner, Welford & Armstrong, New York*.) \$1.50.
- Antelope and Deer of America, a comprehensive scientific Treatise upon the natural History, including the Characteristics, Habits, Affinities, and Capacity for Domestication, of the Antilocapra and Cervidae of North America. John Dean Caton. New York. 8vo. *Hurd & Houghton*. (Announcement).
- Architect's Guide, being a Text-book of useful Information for Architects, Engineers, Surveyors, Contractors, Clerks of Works, &c. Frederick Rogers. London. 8vo. *Crosby & Lockwood*. 6s.
- Arctic Expedition, 1875-6. Journal of Proceedings, &c. (Parliamentary Report.) London. 8vo. 21s.
- Artillery. Handbook for Field Range Finder. Do. for 9-Pounder Rifle Muzzle Loading Guns. Do. for the 16-Pounder Rifled Muzzle Loading Gun of 12 cwt. (Parliamentary.) London. 8vo. Each 6d.
- Art. Renaissance in Italy: the fine Arts and Revival of Learning. John A. Symonds. 2 vols. London. 8vo. *Smith & Elder*. 52s.
- Astronomical and meteorological Observations, during 1874, at U. S. Naval Observatory. (Government publication.) Washington. 4to. *Gov. Printing Office*.
- Myths, based on Flammarrion's "History of the Heavens." John F. Blake. London. 12mo, illus. (*Van Nostrand, New York*.) \$3.00.
- Astronomy, a popular —. Simon Newcomb. New York. illus. *Harpers*. (Announcement.)
- The Origin of the World, according to Revelation and Science. J. W. Dawson. New York. 12mo. *Harpers*. (Announcement.) \$2.00.
- Birds of the Northwest, a Handbook of American Ornithology. Elliott Coues. Boston. 8vo, illus. *Estes & Lauriat*. \$4.50.
- Boiler Insurance and Steam Power Company Limited. Chief Engineer's Report, 1877. Manchester. 8vo, illus.
- Boilers. On the Combustion of refuse vegetable Substances, Straw, Cotton Stalks and Brushwood, under Steam Boilers. John Head, with Abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. Civil Eng.*
- Bridge. Report of Joint Committee of the Legislature of Ohio, concerning the Ash-tabula Bridge Disaster. Columbus. 8vo, illus.
- Bridges, Metropolis Toll —. (Parliamentary Report.) London. 8vo. 5d.
- Butter, its Analysis and Adulterations, specially treating on the Detection and Determination of foreign Fats. Otto Hehner and Arthur Angell. 2nd ed., re-written, imp. and enl. London. 12mo. *Churchill*. 3s. 6d.
- Bronzes of European Origin in the South Kensington Museum; a descriptive Catalogue, with introductory Notice. C. D. E. Fortnum. London. 8vo, illus. *Chapman & Hall*. 30s.
- Catalogue of English Books, containing a complete List of all Books published in Great Britain and Ireland in 1876, with Sizes, Prices, and Publishers' Names. London. 8vo. *Low*. 5s.
- Chemistry; why the Earth's Chemistry is as it is: Three Lectures delivered at Manchester. (Manchester Science Lectures.) J. N. Lockyer. London. 12mo. *Macmillan* (New York). \$0.25.
- Civil Engineer, to be or not to be—by One in Practice. London. 8vo. *Spons* (New York). \$0.20.
- Engineers. Memoirs of the Operations of the Society of —, November, Decem-

* Under Article VI, Code of Rules for the Award of the Norman Medal.

- ber, 1876. January, February, 1877. 2 vols. (French) Paris. 8vo, illus.
- Minutes of Proceedings of the Institution of —, with other selected and abstracted Papers. Ed. by James Forrest. Vols. XLVII, XLVIII. Season 1876-7. London. 8vo, illus. *Inst. Civil Eng.*
- Coffee Planting in southern India and Ceylon. E. C. P. Hull. London. 12mo. *Spons (New York)*. \$3.50.
- Confectionery. How to make Candy, a Manual of plain Directions for Manufacture of the more popular Forms of Confectionery. 2d. ed. Hartford. 12mo. *Fletcher*. \$0.50.
- Decoration, Designs for Furniture and Interior House Decoration, after the latest modern Style. E. Plasmann. In 8 parts. New York, folio, illus. *W. Lindemann*. Each part \$1.50.
- Modern Surface Ornament, a Collection of original Designs of detail Ornament, for the use of ornamental Designers generally. In 6 Parts. New York. 4to, illus. *Sabin & Sons*. Each part \$1.00.
- Docks; the Thames and its Docks: a Lecture. Alexander Forrow. London. 8vo. *Spottiswoode*. 2s. 6d.
- Earth (the), a descriptive History of the Phenomena of the Life of the Globe. E. Reclus. 3rd ed. London. 8vo. *Bickers*. 15s.
- Earthquakes and Volcanos; what is, and what is not, the Cause of Activity in —. R. A. Peacock. London. 8vo. *Spons (New York)*. \$0.20.
- Electro-Metallurgy, the Art of —, including all known Processes of Electro Deposition. G. Gere. New York. 12mo, illus. *Appletons*. \$2.50.
- Embroidery; Art Needlework: a Guide to Embroidery in Crewels, Silks Appliqués, &c., with Instructions as to Stitches, and explanatory Diagrams; also a short History of the Art. E. Massé. London. 12mo. *Ward & Lock*. 1s.
- Engineers and Architects; Minutes of the Saxonian Society of —, Dresden. 8vo. (German).
- and Mechanics Pocket Book. Charles H. Haswell. New and rev. ed. New York. 12mo, illustrated. *Harper Bros*. \$3.00.
- Information for colonial —. ed. by J. T. Hurst. No. 3, India. F. C. Danvers. London. 8vo, illus. *Spons (New York)*. \$1.75.
- Engineering Papers, Abstracts of —, in foreign Transactions and Periodicals. Ed. by James Forrest. (Minutes of Proceedings, Institution of Civil Engineers, Vol. XLVII). London. 8vo. *Inst. Civil Eng.*
- Professional Papers on Indian —. Second Series. Ed. by A. M. Long. Roorkee. 8vo, illus.
- Floods in the Thames Valley, and the Relief of London Bridge and its Approaches. Francis J. Palmer. London. 8vo, illus. *Stanford*. 2s. 6d.
- Forestry, the Schools of — in Europe; a Plea for the Creation of a School of Forestry in Connection with the Arboretum at Edinburgh. John C. Brown. Edinburgh. 8vo. *Oliver & Boyd*. 2s.
- Foundation of the Washington Monument, Report of Committee. Washington. 8vo. *Gov. Printing Office*.
- Gardener, the new practical Window Gardener: being practical Directions for the Cultivation of flowering and foliage Plants in Windows and glazed Cases, and arrangement of Plants and Flowers for Embellishment of the Household. J. R. Molleson. London. 12mo, illus. *Groombridge*. 3s. 6d.
- Geological Explanations of the XL Parallel, Vol. VI. Microscopic Petrography. Fred. Zolkel. Washington. 4to, illus. *Gov. Printing Office*.
- Survey of Canada. Alfred R. C. Selwyn, Director. Report of Progress for 1875-6. Montreal. 8vo, illus. *Dawson*. \$0.25.
- of New Jersey. Annual Report of the State Geologist for 1876. Trenton. 8vo.
- Geology, Elements of Agricultural —. William K. Kedzie. Cincinnati. 12mo. *Van Antwerp, Bragg & Co.* \$0.40.
- Guide to the Examination of —. J. M. Macbirtne. Glasgow. 12mo. *Hadden*. 2s. 6d.
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- Labor, Talks about — and concerning the Evolution of Justice between Laborers and Capitalists. J. N. Larned. New York. 12mo. *Appletons*. \$1.50.
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- Ports of France. Government Publication. (French.) Paris. 8vo. illus.
- Mechanical Engineers. Proceedings of Institution of —. January, 1877. Birmingham. 8vo. illus.
- Mines and Mining at the International Exhibition at Philadelphia. F. Althaus. (German.) Berlin. 8vo.
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- Railroad Employees in France, an Account of the Organization of Railroad Service of a French Railroad, with the Position, Privileges and Pay of Men of different Grades, and the full Regulations of Provident and Pension Funds. F. Jacquemin. Trans. from French. New York. 12mo. *Railroad Gazette.* \$0.25.
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“Copies for distribution” named in this list will, in order of receipt, be sent to members who apply, until the supply is exhausted.

BY THE CENTENNIAL COMMISSION OF THE SOCIETY.

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From S. Webber, Manchester, N. H.;
Manual of Power.

From J. D. Weeks, Pittsburgh, Pa.:
Pittsburgh and Alleghany, Centennial; Year (5 copies).

From G. Whitney & Sons, Philadelphia, Pa.:
Steelled Wheels; the Hamilton Steel Wheel Co. (3 copies.)

From Squire Whipple, Albany, N. Y.:
Girder of Cast Iron Girder Bridges used in England about 1846; a model.
Whipple trapezoidal Truss Bridge; a model, made in 1846.†

From Wisconsin State Commission, Madison, Wis.:
Sketches of Wisconsin and Catalogue of Centennial Exhibit, (copies for distribution).

From T. S. Witherbee, Port Henry, N. Y.:
Furnace at Cedar Point Iron Works; 2 photographs.

From H. R. Worthington, New York;
Report on the Worthington Duplex Pumping Engine, as applied to Water Works.
Water Works Pumping Engine used to supply Grounds and Buildings of the International Exhibition; a photograph.

THROUGH USUAL SOURCES.

From E. N. Beebout, Canton, O.:
Report of Joint Committee, Ohio Legislature, on the Ashtabula Bridge Disaster. Columbus. (Copies for distribution.)

From William H. Bell, Chicago, Ill.:
Map of Old City of New Orleans, and Details of present Drainage Operations.

From John B. Dunklee, Washington.
Specification for Improvement of Elizabeth River, Va. (3 copies.)

From C. Douglas Fox, London, Eng.
Boiler Insurance and Steam Power Co. (Chief Engineer's Report). Manchester, 1877.
Building Woods, Causes of their Decay and Means of Preservation. G. R. Burnell.
Durability of Materials. Edwin Clark. Minutes of Proceedings, Institution of Civil Engineers, Vol. XX, II. London, 1869.
Nature and Properties of Timber. Henry P. Burk. Minutes of Proceedings, Institution of Civil Engineers, Vol. XII. London.
Preservation of Wood in the Sea. A. Forester. (French). Paris. 2 vols. 1868.
South Indian Railways. Specifications for Sleepers. 1874.

From Maj. P. C. Hains, Eng. Secretary, Light House Board, Washington.
Annual Report of the Light House Board, for year ending June 30, 1876. (3 copies.)

From the Hanover Society of Architects and Engineers, Hanover, Germany:
Catalogue of the Library of the Society, Hanover. (German.)

Journal of the Society, Vol. 13, Part 1. Hanover, (German.) 1877.

Transactions of the Society, Vol. XXIII. (2 numbers.) Hanover, (German.)

From Hartford Steam Boiler Inspection Insurance Co., Hartford, Conn.:
Annual Report for 1876. Hartford, (2 copies).

From Charles H. Haswell, New York:
Engineers' and Mechanics' Pocket Book—new ed. Charles H. Haswell, New York.

From Gen. A. A. Humphreys, Chief of Engineers U. S. A., Washington.
Sixth Report on the Improvement of the South Pass of the Mississippi River. C. R. Comstock. Washington. (Copies for distribution.)

United States geological Explorations of the 40th Parallel, Vol. VI. Microscopical Petrography. Fred. Zoikel. Washington.

From Institution of Civil Engineers, London, Eng.:
Elements and Observations as to Emission of Heat by hot Water Pipes. W. Anderson. Excerpts from Minutes of Proceedings. London.

Minutes of Proceedings of the Institution, Vol. XLIII. London.

From D. Kirkaldy, London, Eng.:
An Enquiry into the Properties of Essen and Yorkshire wrought Iron Plates. D. Kirkaldy. London. (3 copies.)

From Charles Latimer, Cleveland, O.:
Comparative Statement of Expenses in Engineering Department, Atlantic & Great Western R. R., February, 1876-7.

From W. H. McFadden, Chief Engineer Water Works, Philadelphia, Pa.:
Topographical Maps of Philadelphia, showing Water Mains and Street Grades. Philadelphia, 1877.

From F. Rinecker, Liestel, Switzerland:

* The first pipe of its size and length laid, and is said to be the first cast, in this country. In casting, the mould was vertical, with hub or bell end down; the spigot end is tapered. 300 tons were laid, forming a continuous circuit of 3 miles, and a portion still is in use as first laid.

† This is believed to illustrate the first intelligent attempt to introduce, from actual calculation, correct proportions for the several parts in bridge trusses or girders, according to the duty required of each part and to reduce the material employed, to a practical minimum.

- American Railroads, G. F. Poissin, Paris. (French.) 1836.
- Baltimore & Ohio R. R. illustrated. Carl Ghega, Vienna. (German.) 1844.
- From Royal United Service Institution. London Eng.:
- Journal of the Institution. Nos. LXXXIX, XC. London, 1877. (2 numbers.)
- From the Saxonian Society of Engineers and Architects, Dresden, Saxony:
- Minutes of the Society. Dresden. (German.)
- From T. S. Sedgwick. Washington.
- Letters from Secretary of War, on the following—(several copies):
- Information upon Constructing a Harbor of Refuge from Ice Floods, at Mill Bottoms.
- Navigation of the Mississippi River.
- Settlement with James B. Eads; Papers and Documents relating to Improvements of South Pass Mississippi River.
- Message from President of the U. S. relating to Boundary Line between United States and British America. (2 copies.)
- Reports on the following—(2 copies each):
- Management and Repairs of Louisville & Portland Canal. G. Weltzel.
- Survey of central Route from Ohio to Kanawha River to Tide Water in Virginia. W. P. Craighill.
- Survey of Union and Central Pacific Railways.
- From Society of Civil Engineers, Paris, France:
- Memoirs and Account of Operations of the Society; November, December, 1876; January, February, 1877. 2 numbers. (French.)
- From Society of Civil Engineers, Stockholm, Sweden:
- Index to Proceedings of the Society. Vols. 1-X. (Swedish.) Stockholm, 4to.
- Proceedings of the Society. Vol. XL. Parts 1-4. (Swedish.) Stockholm, 4to, illus., 1876.
- From Thomsson College of Civil Engineering. Roorkee, East India:
- Professional Papers on Indian Engineering, Vols. I, III, V; 1872-74-76.
- From R. H. Thurston, Hoboken, N. J.:
- Rate of Set of Metals, subjected to Strain for considerable Periods of Time.
- Resistance of Materials as affected by Flow and by Rapidity of Distortion. (German: 4 copies.)
- From John C. Trautwine, Philadelphia:
- Civil Engineer's Pocket Book. Rev. ed. Philadelphia.
- From J. N. Tubbs, Rochester, N. Y.:
- Annual Report of executive Board in Charge of Departments of Water Works, Fire, Highway and Street Improvements of Rochester, for 1876.
- From D. Van Nostrand, New York:
- Boiler Incrustation and Corrosion. F. J. Bowen.
- Practical Treatise on the Properties of continuous Bridges. Charles Bender.
- Steam Injectors; their Theory and Use. L. Pochet.
- Transmission of Power by Wire Ropes. A. W. Stahl.
- From G. K. Warren, Major of Engineers U. S. A., Newport, R. I.:
- Geographical Survey in United States. Remarks on J. D. Whitney's Article in North American Review, 1875, with Account of Organization of the Pacific Railroad. G. K. Warren. (Copies for distribution.)
- From Rudolph Wieser, Cincinnati, O.:
- Kentucky River Bridge, Cincinnati Southern Railway. (2 Photographs.)
- From John Wiley & Sons, New York:
- Elements of Geometry. G. M. Searle. New York.
- Strength and Determination of Structures of Iron and Steel. J. J. Weyrauch. Trans. by A. J. DuBois. New York.
- From unknown Donors or by Purchase:
- American Library Journal. (Monthly.) Vol. I, Nos 1-8. New York.
- Annals of the Minister of Construction, of the Republic of Mexico. Vols. I, II. (Spanish.)
- "Appalachia." Annual Address of the President of the Club. Boston.
- Arches. Treatise on the Construction of oblique—. John Hart. London, 1836.
- Bridge. Machines used in the Construction of Blackfriars—. London.
- Dredge's Suspension—explained upon the Principles of the Lever. W. Turnbull. London. 1841.
- of Santa Trinita over the Arno at Florence. London. n. s. 1822.
- Wooden—on Stone Piers, at Ivry. H. C. Emmerly. (French.) Paris. 1832.
- Bridges. Practical and theoretical Essay on oblique—. G. W. Buck. London. 1839.
- Memoir on Suspension—. C. S. Drewry. London. 1832.
- Memoir on Suspension—and on the Bridge des Invalides. M. Seguin. (French.) Paris. 1820.
- Buildings. Laws relating to—, with Glossary of technical Terms. Chambers & Tattersall. London. 1845.
- Calcareous Cement and the Preparation of Quick-Lime. Experiments to improve—. B. Higgins. London. 1780.
- Canal of the Province of Languedoc. (French.) Paris. 1871-74.
- of the Seine. Navigation of—M. J. Cordier. (French.) Paris. 1820.
- Canals. Description of the St. Denis and St. Martin—. R. D. de Villelars. (French.) Paris. 1826.
- Memoirs on the Locks of—, (French.) Paris. 1825.
- of Great Britain. John Carey. London. 1795.
- of Orleans, Briare and Long. (French.) Paris.
- Report to the King on the Condition of—, (French.) Paris. 1829.
- Tables for Calculations of Formulas relating to the Movement of Water in Canals. R. de Prony. (French.) Paris. 1825.
- Cannon. Fabrication of—, G. Monge. (French.) Paris. 1794.
- Carpenter and Joiner's Assistant. P. Nicholson. London. 1826.
- Carpentry. Principles of—, a Treatise on the Pressure and Equilibrium of Timber Framing. Resistance of Timber and Construction of Floors, Roofs, Bridges, &c. T. Tredgold. Philadelphia. 1817.
- Catalogue of Library of Peter Haast and Edward H. Tracey. New York. 1877.
- Changes in Prices of the Precious Metals. Henry C. Carey. Washington.
- Dam at Cherbourg. J. M. F. Cochin. (French), Paris. 1820.

- Dictionary of technical Terms. (French and English.) J. de Bague. Paris. 1873.
- Directory of Presidents, Superintendents, Master Car Builders, Master Mechanics and Masters of Car Repairs and of Car Manufacturers. New York.
- Dry Rot. Origin and Operation, its Prevention and Cure. R. McWilliam. London. 1818
- Eulogy on Edward Everett. T. T. Davis. Syracuse. 1866.
- Fast Freight Transportation, the American System of—. Philadelphia. (2 copies.)
- Foundations; (submerged)—of hydraulic Works. L. A. Bandemoulin. (French.) Paris. 1829.
- Fuel. Experiments on—to determine comparative Values of the principal Varieties. M. Bull. Philadelphia. 1827.
- Harbor Commissioners. Annual Report of the Board of—, Boston. 1877.
- Heliotype Process. Boston.
- Hydraulics. Researches in—. M. Darcy & Bazin. 4 vols. (French.) Paris. 1865.
- Hydraulic Works at maritime Ports. Construction of—. W. Minard. 2 vols. (French.) Paris. 1846.
- Internal Navigation of the United States, G. Armroyd. Philadelphia. 1830.
- Limes, calcareous Cements, Mortars, Stuccos and Concrete. C. W. Pasley. London. 1838.
- Machine Construction, scientific and practical Method of—. F. Redhenbacher. (French.) Paris. 1868.
- Machinery. Elementary Treatise on—. M. Hatchette. (French.) Paris. 1819.
- Mechanics. Plates to Treatise on—. Chev. de Gerstner. London. 1834.
- Marine Surveying and Hydrometry. Application of—to the Practice of Civil Engineering. David Stevenson. Edinburgh. 1842.
- Mt. Washington Railway. Photograph of a Section showing Curve and Trains.
- Photo-Engraving Co. Quarterly Circular. 1876.
- Pump, improved automatic—. Circular of Hartford Pump Co.
- Railway Commission, Irish—Plans and Sections of the several Lines of Railway. 2 vols. with atlas. London.
- System. History and Prospects of—.
- Gauge Evidence. S. Sidney. London. 1846.
- Railways. Service of the Material and rolling Stock of the Southern—in Austria, during 1872-75. M. A. Gottschalk. (French.) Paris. 1876.
- Treatise on—explaining their Construction and Management. P. le Count. Edinburgh. 1839.
- Repertory of Patent Inventions and other Discoveries and Improvements in Arts, Manufactures and Agriculture. Enl. Series from Commencement. 40 vols. London. 1843-63.
- Roads. Practice of making and repairing. T. Hughes. London. 1838.
- Treatise on—, the Principles on which they should be made, as applied by T. Telford on the Holyhead Road. H. Parnell. London. 1833.
- San Francisco municipal Reports for year ending January 30. 1876. San Francisco.
- Telegraphic Railways, or the Signal Way, recommended for Safety, Economy and Efficiency, under the Safeguard and Conduct of the electric Telegraph. W. F. Cooke. London. 1842.
- Water Supply Materials. Catalogue of—. A. J. Corcoran.
- Supplies for San Francisco. Proceedings and Reports. San Francisco. 1875.
- Works in America, the first—a historical Sketch of the Bethlehem Water Works. Robert Ran. 1877.
- Wind Engine. Catalogue of the U. S.—and Pump Co.
- Circular of Stover's Automatic—.
- Mill. Circular of the Eclipse. Beloit.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: *regular* meetings, when ballots for members will be canvassed and other business done, Thursday, July 12th,* and Wednesday, September 5th; and a *stated* meeting, for consideration of professional topics and enjoyment of social intercourse, Wednesday, June 20th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held July 12th,* and

* The first Wednesday of July being Independence Day, this meeting is postponed as stated.

Wednesday, August 1st, and September 6th, at 3 o'clock P. M.

No regular or stated meetings of the Society will be held from July 12th to September 5th.

PAPERS HAVE BEEN PRESENTED to the Society, since the last announcement, as follows: American Society of Civil Engineers and its Future.

W. Milnor Roberts.....April 25th, 1877.
Brush Dams.

E. P. North.....May 11th, 1877.
Cushioning the reciprocating Parts of Steam Engines.

John W. Hill.....May 23d, 1877,

Description of a Design for a Steam Vacuum Pump.

William H. Lotz.....June 7th, 1877.

Description of recent Tests of the new Iron Bridge over the Kentucky River on line of the Cincinnati Southern Railway.

L. G. F. Bouscaren.....April 25th, 1877.

Details of Methods of Determining the Slope of the Mississippi River, from New Orleans to the Gulf.

E. L. Corthell.....April 25th, 1877.

Failure of Ashtabula Bridge. Discussion:

Thos. C. Clarke, March 20, 1877.

Robert Briggs, " 25, "

Charles Hilton, " 30, "

Theodore Cooper, April 4, "

C. Shaler Smith, " 24, "

Flow of Water in open Channels.

Theodore G. Ellis.....April 20th, 1877.

Improvement of Entrance to Galveston Harbor.

C. W. Howell.....April 24th, 1877.

Memoir of Life and professional Services of the late George W. R. Bayley.

C. G. Forshey, Chairman, April 25th, 1877.

Novel Railroad Survey.

Thomas S. Hardee.....April 25th, 1877.

Patents and Patent Laws, Inventions, Inventors and Authors.

C. G. Forshey.....April 25th, 1877.

Preservation of Timber. Discussion:

C. Douglas Fox.

C. B. Sears... May 25, 1877.

Relative Quantities of Material in Bridges of different Kinds and of various Heights.

C. E. Emery.....April 24th, 1877.

Report of Committee on Tests of American Iron and Steel.

W. S. Smith, Chairman...April 24th, 1877.

Report of Committee on the metric System of Weights and Measures.

C. Herschel. Chairman, April 25th, 1877.

Results of recent Test Levels on the Line of the Erie Canal.

W. H. Searies.....April 25th, 1877.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th next. The conditions of award are set forth in the Code of Rules heretofore published in the Journal; a copy will be furnished to applicants.

No award having been made last year, it is announced that, under Rule VI. two premiums are offered for the coming year, one being a gold medal for the best paper, and

the other, books (costing \$70 currency), for the second best paper, competing.

PAPERS ON ENGINEERING SUBJECTS, giving results of practice, or in discussion of pertinent theoretical questions, are desired from members of the Society; their comments (whether or not present at meetings of the Society), upon papers published in Transactions, are solicited, and they are urged to contribute from note-books and other similar records, whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, Vol. I.

RATES OF POSTAGE on transient matter sent to the Society from domestic post-offices, except New York, are as follows:

On books, pamphlets, periodicals, maps and corrected proof sheets, *one cent per two ounces*; on photographs, lithographs, and engravings, *one cent per ounce*; and on letters and other mail matter, either wholly or partly in writing (except corrected proofs), sealed packages, or those wrapped so as not to be conveniently examined without destroying the wrapper, *three cents per half ounce*. The sender may write or print his address in or on a package, and state names and number of articles enclosed, without extra charge.

Matter upon which not enough postage is prepaid, is charged on delivery with *once or twice* the deficiency, according to class; and it is not infrequent that from \$0.50 to \$5.00 is thus charged.

The attention of members is called to these conditions. Generally, it is better to forward a package by express when the postage thereon exceeds \$0.35, or the rating is uncertain.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. They are open from 9 o'clock, A. M. to 5 o'clock, P. M. each business day, except Saturday, when they are closed at 3 o'clock, P. M. Members desiring admission outside these hours, are requested to apply to the Secretary.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election
HARDEE, THOMAS S.....Chief Eng., Louisiana Levee Co., New Orleans, La.....	April 4, 1877.
HARROD, BENJAMIN M.....Architect and Ass't City Eng., New Orleans, La.....	" " "
HILLMAN, CHARLES F.....Civil Engineer, Chili, S. A.....	July 5, 1876.
KEEFER, THOMAS C. ....Ottawa, Can.....	April 4, 1877.
LE CONTE, LOUIS J.....Res. Eng. in Charge of Harbor Improvements, Oakland, Cal.....	" " "

CHANGES AND CORRECTIONS.

BAXTER, GEORGE S.....	227 Lexington av., New York.
BISELL, H.....	East Windsor, Conn.
BOGUE, VIRGIL G.....	Care Henry Meiggs, Lima, Peru.
BRIGGS, ROBERT.....	220 S. Fourth st., Philadelphia, Pa.
BRODHEAD, CALVIN E.....	Hickory Run, Carbon Co., Pa.
BROWN, ROBERT N.....	Care Maj. Whitney, Niagara Falls, N. Y.
BUCK, LEFFERT L.....	Care Col. W. H. Paine, Pier 29, E. R., New York.
FRANCIS, HENRY N.....	Ass't City Eng., 35 N. Main st., Providence, R. I.
GUNN, OTIS B.....	Lawrence, Kansas.
HORTON, SANDFORD.....	Ass't Eng., Albert Lea Extension, B. C. R. & N. R'y, Northwood, Worth Co., Iowa.
KNIGHT, WILLIAM B.....	240 E. Seventy-seventh st., New York.
RICE, EDWARD C.....	3631 Baker av., St. Louis, Mo.
ROBERTS, W. MILNOR.....	Middleton, Annapolis Co., Nova Scotia.
STAUFFER, DAVID M.....	127 S. Thirteenth st., Philadelphia, Pa.
STUCKLE, HENRY W.....	Care W. E. Worthen, 63 Bleeker st., New York.
SWAN, CHARLES H.....	35 N. Main st., Providence, R. I.
WEIR, FREDERICK C.....	507 W. Seventh st., Cincinnati, O.

DECEASED.

NICKERSON, LOUIS.....	Baltimore, Md.....	May 6th, 1877.
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. July, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JUNE 20TH AND JULY 4TH, 1877.—A quorum not being present, the meetings were adjourned.

OF THE BOARD OF DIRECTION.

JUNE 20TH, 1877.—An adjourned meeting was held at three o'clock P. M.; proposals for admission to membership were considered.

JULY 2D, 1877.—A special meeting was held at three o'clock P. M.; proposals for admission to membership were considered.

Messrs. William E. Worthen, J. James R. Croes and G. Leverich were appointed a committee to arrange and furnish the Society's rooms.

Attention was called to resolutions adopted at the Ninth Annual Convention, relating to a metric standard of weights and measures; * the best system of weights and measures for the use of engineers; † the reading of papers on engineering subjects at Annual Conventions, ‡ and the division of Conventions into sections; § and under By-Laws, Section 30, Messrs. Theodore G. Ellis, J. James R. Croes and Matthias N. Forney were appointed a committee to report for each, a form of letter ballot with such statements as shall succinctly set forth the reasons for and against the proposed action.

JULY 4TH, 1877.—In absence of a quorum, the stated meeting was not held.

* Page 47.

† Page 48.

‡ Page 51.

§ Page 52.

REPORTS OF COMMITTEES.

ON TESTS OF AMERICAN IRON AND STEEL.

PRESENTED APRIL 25TH, 1877.

In behalf of the Committee on Tests of American Iron and Steel, I have to submit the following report:

On December 22d, 1876, the Chairman of the Committee addressed a letter to Gen. U. S. Grant, then President of the United States, requesting him "to direct the Secretaries of the Treasury, War and Navy, to report the opinions of the Chiefs of their several Departments on the practical benefits to be expected to be realized from the labors of the Board appointed to test Iron, Steel and other Metals when it has entered fairly upon its work." A copy of this letter is herewith submitted.* Such directions were given to the Secretaries, by the President, and most favorable opinions were returned by the heads of some of the Departments. Whether all replied or not, the Committee has not learned.

The President also addressed a special message to Congress, very clearly setting forth

**To the President of the United States:*

Sir.—The testing machine for the use of the Board appointed to test American Iron, Steel and other Metals, will, it is now thought, be completed and ready for use by February 1st next. It will be, as we believe, by far the most accurate machine ever employed in testing metals.

The Board has planned an inquiry that will be, if properly carried on to completion, comprehensive and exhaustive, surpassing in useful results, any similar investigation ever made by this or any other government. The value and importance of this work may be ascertained and set forth to some extent beforehand. And in order to do this, we would respectfully request that you direct the Secretaries of the Treasury, War and Navy, to report the opinions of the Chiefs of their several Departments on the practical benefits to be expected to be realized from the labors of the Board appointed to test Iron, Steel and other Metals when it has entered fairly upon its work with the excellent machine now nearly completed and ready for its use, and that the views of these Chiefs of Departments shall be given in full without delay.

We will cheerfully explain the plans adopted by the Board for carrying on its tests and investigations to the Chiefs of Departments, whenever invited to do so, without any cost to the government.

The interest heretofore manifested by you in the work of the Board, so nearly related as it is to most of the great industries of the country, has encouraged us to make the above request.

Very respectfully,
WM. SOOT SMITH,
Chairman.

the value and importance of the work undertaken by the Board. This was also done, by memorials and resolutions adopted by various scientific societies, and by the faculties of many of the leading universities, colleges and technological institutions of the United States, as already stated in a former report*—so that Congress has been fully informed of the nature of the work proposed, and it has been urged in every legitimate way open to the Committee, to make the necessary appropriations to carry it forward.

The clause of the Civil Appropriation Bill,† making an appropriation of something over \$19 000 for the use of the Board, during the present fiscal year, contains a provision that the Board shall cease to exist when that appropriation has been expended.

It was hoped and believed that the desire for additional knowledge of the characteristics of iron and steel, awakened by the Ashtabula disaster, would induce Congress to repeal so much of the bill referred to, as provided for the discontinuance of the Board, as above stated, and make such further appropriations as the Board might require, to finish its labors. But partly owing, no doubt, to the intense political excitement consequent upon the presidential election, and the deep anxiety that was caused by the uncertainty of the result—it was impossible for this Committee to get any favorable consideration by Congress of the matter with which it is charged by the Society.

After a great deal of fruitless effort, we succeeded in getting a clause introduced in the "Sundry Civil Bill," in the form of a Senate Amendment, appropriating \$40 000 for the use of the Board, and repealing the hostile clause of the previous bill. The Senate and House found it necessary to appoint a conference committee to fix the provisions of the bill, and the Senate receded from the amendment making our appropriation and saving the life of the Board.

It will thus be seen by the members of the Society, that the Board will cease to exist before its labors are fairly begun, and the work to which many of us have given such earnest attention and from which we have anticipated so much that would be beneficial to us as an

* Vol. II, page 155. † Vol. II, page 100.

gineers, and to the country at large, must be dropped before it has yielded more than a tithe of the fruits it has promised.

The Committee considers it unnecessary to more than merely allude here, to the want of knowledge of the characteristics of the new varieties of iron and steel offered for our use, of which we are all so painfully conscious, to bring the mind of each member of the Society to a realization of the value of the knowledge which seems just within our grasp. Shall we fail to attain it?

We beg each member to put this question to himself. There is not a member of Congress of the United States who cannot be reached through some member of our Society, who is personally acquainted with him.

Let us make a vigorous effort at once to get Congress to repeal the legislation discontinuing the Board when the money already appropriated has been expended, and to appropri-

ate the money which the Board may need to enable it to complete the very valuable work it has undertaken.

The Committee has spared no effort to secure the aid of our government to carry forward the investigations in which we all feel so deep an interest. The civil engineers on the Board work without pay and have given much valuable time to this service. Does not the entire Society owe it to the Committee and to the Board to make the effort here suggested at once and with a zeal that must make it successful? The Committee confesses its inability to do any more than has already been done by it, without the aid of the whole Society; and this must be given at once, or the effort of the Society to induce our government to do a noble work must end in absolute and ridiculous failure.

Respectfully,
WM. SOOT SMITH,
Chairman.

OF THE CENTENNIAL COMMISSION OF THE SOCIETY.

PRESENTED APRIL 25TH, 1877.

The labors connected with the close of the Exhibition and the work found necessary afterwards, both in Philadelphia and New York, in properly distributing, packing and returning to their destinations, the various exhibits made under the auspices of the Commission, have proved as arduous as any which the Secretary has undertaken.

When the exhibits were received at the opening of the Exhibition, the cases in which they were packed were taken in charge by the Exhibition authorities and stored in sheds outside the grounds. No other arrangements were permitted. 130 boxes were thus taken away from us and stored. At the end of the Exhibition, only 11 boxes were returned, the fire which occurred during the summer being credited by the Centennial authorities with all that were missing. It thus became necessary to provide proper cases in which the exhibits could be packed, for return to their owners, or to the Society rooms. It is believed that all the articles have been safely transported. Much correspondence has been requisite in this work.

In order to secure for the Society, the advantage of permanent use of as much of our exhibit as possible,* the following circular was prepared and sent to our exhibitors:

"Philadelphia, November 3d, 1876.

"At the close of the Exhibition, this Commission is preparing to return to the owners, or to the rooms of the Society, the various ex-

hibits. One of the advantages which has been anticipated from the work of the Exhibition, is the increase of the permanent collection of the Society, and this Commission hopes that as many of the exhibits as can be spared by the owners, will be donated to the Society.

"Will you please, by return mail give directions as to the disposition to be made of your exhibit."

The response has been very gratifying, and we have received and transferred to the permanent collection of the Society, a valuable amount of interesting material which has been donated by American exhibitors under our auspices. The exhibits so donated are 1328 in number, and illustrate nearly all branches of engineering. A catalogue of these donations has been prepared for printing.*

During the Exhibition and after its close, care was taken to secure from foreigners exhibiting material of interest to engineers, such donations as were to be obtained. In this effort we have been successful, and have received and transferred to the Society for its permanent collection, 474 separate exhibits donated from various countries. Among these, should be specially mentioned, the exhibits of the Austrian Society of Engineers and Architects, received by the Commission through Mr. Ernest Pontzen, an Austrian Imperial Commissioner and a member of our

* See Additions to Library and Museum, page 59.

Society; also the engineering exhibit of the Swiss Republic, received by the Commission through Mr. Edward Guyer, Swiss Federal Commissioner. Both of these exhibits, are of very decided engineering interest; many of the contributions from other countries are also valuable. A catalogue of these donations has been prepared for printing.*

In order to reciprocate to some extent, the kindness shown in the donation of these foreign exhibits, a collection has been made by the Secretary, of over 500 lithographs, photographs, albums, etc., illustrating various American engineering works, and these are to be forwarded to the foreign gentlemen or societies, from whom donations were received.

The general exhibit made under the auspices of our Commission in the West Gallery of the Main Building, and in our two spaces in Machinery Hall, comprised 1 900

separate exhibits, duplicates not being included in this number. These exhibits included:

65 framed pictures;
160 models, full sized machines, connections and special parts;
450 separate photographs;
35 albums of photographs and plates;
309 books;
130 manuscript memoirs;
743 plans, maps and drawings.

The Commission has taken measures to secure through its sub-committees, memoirs upon the various engineering subjects illustrated at the Exhibition or connected with the history and progress of engineering in the United States. It is hoped that these may be finished and published during the present year.

JOHN BOGART,
Res. Secretary.

THEO. G. ELLIS,
Chairman.

ON QUARTERS FOR THE SOCIETY.

Presented April 25th, 1877.

The Committee upon Quarters for the Society reports, that after considerable deliberation upon the subject of the best provision for a future home for the Society, the following circular was adopted and sent to members:

"NEW YORK, February 28, 1877.

"The Committee appointed to provide quarters desires to lay before the Society the following points:

"The lease of the present rooms expires on May 1st, and the rent has been raised \$400. The constant additions to the library, and particularly the large amount of valuable exhibits acquired through the Centennial Commission, render more space necessary than the present rooms afford. The material from the Exhibition has been stored, as there is really now no place to put it. To obtain sufficient space adjacent to the present rooms, would add \$1 200 to the rent now paid.

"It is considered very desirable that a house should be secured for the permanent home of the Society. If this can be effected, a release will be afforded from the constant drain of a heavy rental, and many other advantages will be assured.

"At this time, real estate can be bought at very low figures. After an examination as to available houses, the Committee has come to the conclusion that a voluntary

subscription of an amount equal to the dues of each member for one year, would warrant the purchase of a suitable house.

"As it is necessary to decide the question very soon, this means is taken of presenting it to you. Will you, therefore, reply to this circular, per blank annexed, at once (answers to be canvassed before March 15th), stating whether you agree with the proposed movement, and whether you will subscribe the amount of one year's dues, or more. (It is not intended to limit the amount of subscription.)"

The response to this circular, has been quite full, and the expression of the great majority of the answers is decidedly in favor of the purchase of a suitable house for permanent occupation. Upon full consideration, it has been decided that such a purchase was too important a matter to allow the slightest danger of mistake.

Two distinct questions are to be solved. 1st.—The best means of securing a fund sufficient to provide the quarters most desirable. 2d.—The determination as to the quarters, with reference to the location, size, price to be paid and future necessities of the Society. Various solutions of these questions have been discussed, and it has been thought best by the Committee, that the Society should take more time than would elapse before its present lease expires. As the rent of its present rooms, has been largely increased, and as the rooms are really too small, a com-

* See Additions to Library and Museum, page 57.

modious house in an excellent location, 104 East Twentieth Street, has been rented, for the present, for the same rental the Society has paid for its rooms during the past two years.

The Committee deems it for the best interests of the Society that the movement for a permanent home, either by purchase of or

by building a house, should be continued, and the report recommends that this work be carried forward as speedily as is consistent with an assurance of the best result.

Respectfully,

JOHN BOGART,
Chairman.

NOTES AND MEMORANDA.

REPORTS OF MEETINGS.

ADDRESS OF W. MILNOR ROBERTS, at opening of the Ninth Annual Convention.

The Convention was called to order at 10.30 o'clock A. M., April 24th, by John Bogart, Treasurer of the Society, who announced that W. Milnor Roberts would, as representing the Board of Direction, make an address.

MR. ROBERTS said: In the absence of the President and Vice-Presidents, I am requested, as a member of the Board of Direction and past Vice-President, to open the Convention, and to aid, so far as I can, at the business meeting of the Convention.

You will agree with me that this short notice, under the circumstances, can only call for almost impromptu remarks—such as could be jotted down at brief intervals in the cars, when traveling at the rate of 35 miles an hour, more or less, over 1 800 miles of railroad. I must therefore crave the indulgence of the members for attempting to throw together in such a crude manner, a few thoughts for the occasion of this, our Ninth Annual Convention, which for good reasons, the Society decided should be held in the city of New Orleans.

It is our custom to hold these Annual Conventions in different cities, and in different States of the Union; partly because of the cosmopolitan character of civil engineers and especially of our cosmopolitan membership, and partly to afford an opportunity for extending our intercourse socially as well as professionally among our friendly fellow-citizens.

New Orleans was selected for our Society re-union this year—*first*, for the reason that we have never met as a Society in this portion of our extensive country; *second*, because there is a very important engineering problem now undergoing solution in this vicinity—namely, the improvement of the South Pass of the Mississippi by means of jetties; *third*, because there are other engineering works and operations of great public interest going on near here under the auspices of the general government, and also

under the state government: and *last*, though not least, because we were assured by those of our members who reside in this city, and who, it is presumed, ought to know, that we should meet with a friendly welcome.

These were some of the considerations which have led to our coming here at this time. But from this bare reference to the inducements, we may get an inkling of what may agreeably engage our attention, professionally and otherwise, during our visit.

There are too, many historical associations connected with the names of Louisiana and New Orleans which are familiar to all. There are others, doubtless, the particulars of which, if called for, will be cheerfully given to us by our resident friends. I will content myself for the moment by recalling only one well known event—the Battle of New Orleans; and its hero, General Jackson, who, as history says, saved this fair city from the ravages of Pakenham's army.

Although party politics are not admitted into the discussions of our Society, yet, as individual members of one common country, we cannot but feel gratified that our present visit happens to be simultaneous with the peaceable settlement of important public questions, affecting not only the welfare of the State of Louisiana but of the entire Union. Peace hath her victories, now war "hath smoothed his wrinkled front," and the "engineer," instead of being "hoist with his own petard," is engaged in harnessing the mighty Father of Waters, curbing his mouth, directing his course and regulating his speed; and, to change the metaphor, making him work his passage out to sea.

Some of our members who are familiar with the sources of the Mississippi in Montana, Dakota, Minnesota and elsewhere, have never before had an opportunity of seeing all its vast accumulation of waters—the drainage of a million and a half square miles—concentrated in a single channel, half a mile wide; averaging, when in flood, 150 feet deep.

flowing at the rate of 4 miles or more per hour, presenting a cross-section of 400 000 square feet, and a flow of 140 000 000 cubic feet per minute. These are, of course, only round numbers, to give a general idea. The high water or flood line is 15 feet above low water at New Orleans. In such a flood, there is, of course, a fall of 15 feet in about 120 miles, to the Gulf, in excess of the low-water plane—an average of $1\frac{1}{4}$ inches per mile.

Every engineer will recollect Brinley's opinion that "rivers were made to feed navigable canals," but modern experience shows that in many cases, *railroads* have been made to supersede canals, which, as an old canal engineer, I think was naughty, though they never supersede navigable rivers; in fact, the prime mission of railroads everywhere, is to bring freights of all kinds to navigable waters, in order that they may be transported thereon at cheaper rates. But for ocean facilities, we could not send our surplus grain to Europe, on account of distance and the railroad charges that would arise. Hence the farther inland upon this continent we can extend deep navigation for ocean-going vessels, the better for the world's commerce. As a natural corollary, the whole world is interested in securing a deep sea entrance into the Mississippi river through the bar at its mouth. And this is the great engineering problem to which the attention of our members will be especially called at this time.

This is perhaps, enough of hydraulics for a start. Besides, I see before me, a member who must be a near relative of the Father of Waters, as he is certainly the father of hydraulic investigation in this country and in this Society, James B. Francis. And furthermore, we have members in this city, among them Caleb G. Forshey, Charles W. Howell, Elmer L. Corthell, James B. Eads and others, who can lead you down to the guards with river information of every description.

While we regret, that many who wished to be present at this Convention have been prevented from attending, we may still congratulate ourselves upon the number who are here; some having come more than 2 000 miles from points in New England, and some from St. Paul, Chicago, St. Louis, etc., and other far off places in the interior; but the great benefactor of this continent, the Father of Waters, has coursed his way from the picturesque nooks among the Rocky Mountains for 4 400 miles to reach this pleasant place of rendezvous, in the city of New Orleans.

There are objects of great interest in this

city and its surroundings which will be more particularly referred to, by the members resident of New Orleans. One of the most striking, is the relative height of the river and the city (the river being higher than the city), and the methods adopted for draining the city into Lake Pontchartrain. Then there is the levee system, which has long commanded the earnest attention of engineers and of the interested States, as well as of the national government. When I say interested States, I mean every state, and each one in every state, single or matrimonial; all, without exception, are interested in having the great parent river kept within proper bounds, and made more and more useful as he descends into the vale of years, or the gulf of Mexico.

I at first believed that this would be a proper paragraph at which to stop my train of thought; but as we bowled along, sometimes at the rate of over 50 miles an hour, a few other thoughts sprang unbidden, and seemed worthy of jotting down—such as our statistics of membership. Our beginning as an organization dates from 1852; but in 1855, it went into a Rip Van Winkle doze, and did not wake for twelve years; so that its real, live start was only about ten years ago, in 1867, when about 50 members were enrolled. We now have* in all 580, of which number there are 440 Members, 45 Juniors, 16 Associates, 6 Honorary Members, 70 Fellows, and 3 Corresponding Members, and these hail from all quarters of the Union, and from Europe and South America and Canada.

With a few words more, I will conclude. It is customary to make thankful mention of favors received, at the close of our proceedings. This will doubtless be done; but in behalf of a large number of members and others who have partaken of the liberality and kindness of the several railroad companies between New York and New Orleans and especially of the gentlemen in charge between Louisville and Mobile, at Mobile, and between Mobile and New Orleans, I can but thank them for their kind courtesies and abundant provision for our comfort.

Now without further amplification, and with the understanding that our Society comes here to learn and not as a teacher upon this occasion, I beg leave respectfully, in accordance with custom, to suggest the name of a Member, an old resident of the city, as the presiding officer of the Convention, Caleb G. Forshey.

* See Report of Board of Direction, November 1st, 1876, Vol. II., page 138.

LIST OF NEW BOOKS ON ENGINEERING AND TECHNOLOGY.

- Agriculture, tropical —, a Treatise on the Culture, Preparation, Commerce and Consumption of the principal Products of the vegetable Kingdom. P. L. Simmonin. London. 8vo. *Spons. (New York)* \$8.00.
- Air, the Production and Use of compressed —, in Mining Operations. M. F. L. Cornet. Philadelphia. 8vo. *Franklin Institute*.
- Antelope and Deer of America; a comprehensive Treatise upon the Characteristics, Habits, Affinities and Capacity of Domestication of Anilocapia and Cervidae of North America. John D. Caton. New York. 8vo, illus. *Hurd & Houghton*. \$4.00.
- Architecture, Notes on Irish —. Earl Dunraven; ed. by St. Kes. 2 vols. London, 4to, illus. *Bell & Sons*. Vol. II. 84s.
- Arms and Armor, from the earliest Period to the present Time. A. Demolin; trans. by C. C. Black. (Bohn's Artist's Library.) London. 12mo, illus. *Bell & Sons*. 7s. 6d.
- Art Anatomy. William Rimmer; comprising 486 Designs on 81 Heliotype plates, illustrating every portion of the human Figure, with descriptive Text. Boston, 4to. *Little, Brown & Co.* \$50.00.
- Education applied to Industry, with Descriptions of Industrial Art in the Middle Ages; the different Systems of Art Education in Europe, and that best adapted to the United States; and industrial Art at the Centennial Exhibition. George Ward Nichols. 8vo, illus. *Harpers*. \$4.00.
- Treasures of Art, Industry and Manufacture represented at the International Exhibition, 1876. Ed. by C. B. Norton. In 25 parts. Parts I. II. Philadelphia. *Clegg & Co.* Per part, \$2.00.
- Battles of Columby-Nouilly and Vionville, practical Studies of —, comp. and arran. from official Accounts by Lonsdale A. Hale. (British Gov. Publication.) London. 8vo. 4s. 6d.
- Betting, a Treatise on the Use of — for the Transmission of Power. John H. Cooper. Philadelphia. 8vo. *Claxton, Remsen & Haffelfinger*. \$3.50.
- Bridge, Report of consulting Engineers appointed to recommend a Plan for the New York & Long Island Bridge across the East River at Backwell's Island. New York. 8vo, illus.
- Canals, annual Report of State Engineer and Surveyor on the — of State of New York for year ending Sept. 30, 1876. J. D. Van Buren, Jr. Albany. 8vo.
- Cavalry, a History of —, from the earliest Times, with Lessons for the Future. Geo. T. Denison. London. 8vo, illus. *Macmillan (New York)*. \$6.50.
- Ceramic Art of Japan. Audsley and Bowes. 7 parts. London. Folio. *H. Sotheran*. 189s.
- Chemistry, elementary —; a Text-Book for Beginners. S. F. Peckham. Boston. 12mo, illus. *Norton*.
- the Laboratory Guide; a Manual of practical Chemistry, specially arranged for agricultural Students. A. H. Church. 4th ed., rev. London. 8vo, illus. *Van Voorst*. 6s. 6d.
- Short Notes on —. Part I. Metallurgy. C. E. Shelly. 2d ed., rev. and enl. London. 8vo. (*Van Nostrand, New York*). \$1.00.
- Coal Mines of the western Coast of the United States. W. A. Goodyear. San Francisco. 12mo. *Bancroft*. \$2.50.
- Commerce, Nineteenth annual Report of the Corporation of the Chamber of — of State of New York, for 1876-7. In 2 parts, compiled by George Wilson. New York. 8vo. *Cham. of Commerce*.
- Cremation Society of England, Transactions of — —. No. 1. London. 8vo, illus. *Smith & Elder*. 1s.
- Dew Points; a short practical Treatise on —. H. P. Slade. London. 8vo. *Spons. (New York)*. 2s.
- Drawing, Treatise on linear Perspective —. J. and G. Yule. 2d ed. London. 4to. *Waterson*. 2s. 6d.
- Electrical Diagrams and Connections, Handbook of —. Charles H. Davis and Frank B. Rea. 2d ed. New York. 8vo. *Van Nostrand*. \$2.00.
- Electricity, Magnetism, and Acoustics, Handbook of —. Dionysius Lardner. Ed. by George C. Foster. London. 8vo. *Lockwood, Crosby & Co.* 6s.
- Electro-Metallurgy practically treated. A. Watt. 6th ed., with Additions. (Weale's Series.) London. 12mo, illus. *Lockwood, Crosby & Co.* 2s.
- Engineers', Transactions of the Society of —, for 1876. Ed. by F. H. Nursery. London. 8vo., illus. *Spons. (New York)*. 15s.
- Farming, Outlines of modern —. Soils, Manures and Crops; Farming and Farming Economy, historical and practical; Cattle, Sheep and Horses; Management of the Dairy, Pigs and Poultry, with Notes on the Diseases of Stock; Utilization of Town Sewage, Irrigation and Reclamation of Waste Land. R. Scott Burn. New ed. London. 8vo, illus. *Lockwood, Crosby & Co.* 12s.
- Gas Users, Common Sense for —, being a Catechism of Gas Lighting for House-Holders, Mill-Owners, and other large Consumers, Gas Fitters, Architects, Engineers, &c. Robert Wilson. London. 12mo. *Lockwood, Crosby & Co.* 2s. 6d.
- Geologist, the Pocket —, and Book of Minerals. F. H. Smith. Baltimore. 12mo. \$1.00.
- Geology for Students and general Readers. A. H. Green. 2d. ed. London. 8vo, illus. *Daldy & Isbister*. 12s. 6d.
- River Terraces; Letters on geological and other Subjects. G. Greenwood. London. 8vo. *Longmans*. 10s. 6d.
- Geometry, Elements of —: Euclid. Book I. E. Atkins. London. 12mo. *Collins*. 9d.
- Health, Eighth annual Report of State Board of —, of Massachusetts. January, 1877. Boston. 8vo.
- Heat, the Handbook of —. Dionysius Lardner. Ed. and re-written by Benjamin Loewy. London. 8vo, illus. *Lockwood, Crosby & Co.* 6s.
- Hydrostatics and Pneumatics, Handbook of —. Dionysius Lardner. Ed. by Benjamin Loewy. London. 8vo, illus. *Lockwood*. 5s.
- Iron and Steel, annual Report of Secretary of the American — Association. J. W. Swank. Philadelphia. 8vo. *Am. Iron and Steel Ass'n*.
- Kinematic Models. P. Kennedy. London. 12mo, illus. *Macmillan & Co. (New York)*.

- Life, the Puzzle of — and how It has been put together. Arthur Nicols. 2d ed. London. 8vo. *Longmans*. 3s. 6d.
- Light, being Vol. I, experimental Series for Beginners. Ed. by A. M. Mayer. asst'd by Charles Barnard. New York, *Appleton & Co.* (Announcement.)
- Locomotive-Engine Driving, from the Foot-plate; a practical Manual for Engineers in charge of Locomotive Engines. Michael Reynolds. London. 12mo, illus. *Lockwood, Crosby & Co.* (Announcement.)
- Lumber Dealers, an improved Tally-book for —, with the Walnut Scale. F. Webb and M. C. Johnston. Cincinnati. 12mo. *K. Clarke & Co.* \$0.50.
- Magnetism of Iron Vessels, with a short Treatise on terrestrial Magnetism. Fairman Rogers. (Van Nostrand Science Series). New York. 18mo, illus. *Van Nostrand*. \$0.30.
- Manufacturing Industries, British: Wool, Flax, Cotton and Silk. Ed. by G. Phillips Bevan. 2d ed. 12mo, illus. *Stanford*. (Van Nostrand. New York.) \$1.75.
- Mechanics, Hand-book of —. Dionysius Lardner. Enlarged and re-written by Benjamin Loewy. London. 8vo, illus. *Lockwood, Crosby & Co.* 6s.
- Metric Manual, the Teacher's —; a complete Guide to the most effective Teaching of the Metric Weights and Measures. Boston illus. *Am. Metric Bureau*. (Announcement.) \$0.30.
- Militia, Discipline and Drill of —, a Series of Lectures. Frank S. Arnold. New York. 8vo. *Van Nostrand*. (Announcement.) \$1.50.
- Mind, Elements of Philosophy of the human —. D. Stewart. New ed. London. 8vo. *Tegg*. 7s.
- Mines, the simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses. J. H. Streidinger. Vienna. 8vo. (German).
- Music: a complete Text-Book of theoretical Music, with Glossary of musical Terms, Exercises on Harmony, and an Appendix. H. S. Bannister. 5th ed. 8vo. *Bell & Sons*.
- Natural History, Elements of —. A. E. Dolbear. Boston. *Ginn & Heath*. (Announcement.)
- Handbook of —. Dionysius Lardner. 5 vols. London. 8vo. *Lockwood, Crosby & Co.* 27s.
- Nautical Tables. Norries. New ed. London. 8vo. *C. Wilson*. 10s. 6l.
- Navigation, elementary —. W. H. Rosser. London. 12mo. *C. Wilson*. 2s.
- Epitome of practical —, with a complete Set of nautical Tables. Norries. New ed. London. 8vo. *C. Wilson*. 16s.
- Handy Book of —. Ad. Bethune. London. 8vo. *Blackwoods*. 5s.
- North Polar Expedition. Narrative of —. U. S. Ship *Polaris*. Ed. by C. H. Davis. Washington. 4to, illus. *Gov. Printing Office*.
- Optics, the Handbook of —. Dionysius Lardner. Ed. by T. Oliver Harding. London. 8vo, illus. *Lockwood, Crosby & Co.* 5s.
- Painting, a Treatise on —. Da Vinci, trans. from the Italian by John F. Rigaud, with a Life and an Account of his Works by John W. Brown. New ed. rev. (Bohn's Artist's Library.) London. 12mo. *Bell & Sons*. 5s.
- Patents, annual Report of the Commissioner of —, for year 1876, and Index. Washington. 8vo. *Gov. Printing Office*.
- Photography, C. Abney. London. 12mo, illus. *Macmillan*. (New York).
- Planting, a Discourse concerning western Planting, written in year 1584, by Richard Hakluyt. Now first printed from a contemporary Manuscript, with Preface and Introduction by Leonard Woods, and Notes in the Appendix, by Charles Deane. Boston. 8vo. *Williams*. \$3.00.
- Railroads and Telegraphs, Tenth annual Report of the Commissioners of — of Ohio, for year ending June 30th, 1876. Columbus. 8vo.
- Observations on — in the United States. Augustus Morris. Sydney. 8vo, illus.
- Railway Revenue and its Collection. Marshall M. Kirkman. New York. 12mo. *Railroad Gazette*. (Announcement.) \$2.50.
- Rapid Transit. Board of the Department of Public Parks. Report of the Civil and Topographical Engineer and the Landscape Architect accompanying a Plan for local Steam Transit Routes in 23d and 24th Wards. New York, 8vo. Map. (Corrected Title.)
- Railways, Indian —, their past History, present Condition and future Prospects. Julian Danvers. London. 8vo. *E. Wilson*.
- Roads and Streets, Construction of —. D. Kinneir Clark. London. *Lockwood, Crosby & Co.* (Announcement.)
- Sewage Question, the present Aspect of — as applied to Boston, a Paper read before the Am. Statistical Soc., Boston, April 30th, 1877. Charles F. Folsom. Boston. *Williams*. \$0.10.
- Water Purification of —, for the Guidance of Corporations, local Boards of Health, and sanitary Authorities. Henry Robinson and John Charles Melliss. London. 8vo. *Smith & Elder*. 5s.
- Steam Boiler Engineering, a Treatise on —, being Notes on the Strength, Construction, Erection, Fittings and economical Management of Steam Boilers. W. B. Levan. Philadelphia. 12mo. (Van Nostrand.)
- Inspection, Annual Report of Hartford — Inspection and Insurance Co. 1876. Hartford. 8vo, illus.
- Engine, History of —. Robert H. Thurston. New York, illus. *Appleton & Co.* (Announcement.)
- Stones and Gems: their History and distinguishing Characteristics. Edwin W. Streeter. London. 8vo, illus. *Chapman & Hall*. 18s.
- Takimetry; concrete Geometry in 3 Lessons, accessible, inaccessible, incalculable; fundamental Takimetry. Edward Lagout. Trans. with unpub. Additions, by Daniel W. Gwynne. London. 8vo. *Codins*. (Van Nostrand, New York.) \$1.23.
- Telegraphic Messages, Secret Code for —. W. Macgregor. London. 8vo. *Waterson*. 10s. 6d.
- Telegraph (the) Office; or, simple Instructions in the Mechanism of Instruments and Batteries, comp. by Officers of Royal Engineers. London. 12mo. *Cassell*. 1s.
- Trigonometry, spherical —. J. J. Mills Peirce. Boston. *Ginn & Heath*. (Announcement.)
- War, a critical History of the late American —. A. Mahan, with introductory Letter by M. W. Smith. New York. 8vo. *Van Nostrand*. \$3.00.
- Franco-German War, 1870-71. Part I: History of the War against the Republic. 10th Section: Investment of Paris; Capture of Toul and Strasburg, trans. from Ger-

man official Account at the Intelligence Branch of the Quartermaster General's Department. Horse Guards, by F. C. H. Clarke. London. 8vo. (British Gov. Publication). 7s. 6d.
 Water, Air and Disinfectants. W. Noel Hartley. London. 16mo. (*Van Nostrand, New York*). \$0 50.
 Whitworth measuring Machine. T. Good-

eve and P. B. Shelley. London. 4to. *Longmans*. 21s.
 Winds and their Story of the World. W. L. Jordan. London. 8vo. *Hardwick & Bogue*. 5s.
 Yachtmen's Handy Book. London. 8vo. C. Wilson. 3s. 6d.
 Yachtmen, under Square Sails, for Yachtmen and Midshipmen. Thomas H. Withers. London. 8vo. C. Wilson. 2s.

ADDITIONS TO

LIBRARY AND MUSEUM.

From American Iron and Steel Association. Philadelphia:
 Annual Report of Secretary of the Association. Philadelphia. 1877. (2 copies.)

From Gen. J. G. Barnard. New York:
 Report of Board of Consulting Engineers upon Plan for N. Y. and Long Island Bridge. New York.

Also from others; (copies for distribution.)

From M. J. Becker, Columbus, O.; also from J. M. Woodwin, Cleveland, O.:
 Report of Joint Committee, Ohio Legislature, on the Ashtabula Bridge Disaster, Columbus. (Copies for distribution.)

From Chamber of Commerce, New York:
 Nineteenth Annual Report of the Chamber of Commerce, of New York, for 1876-7.

From R. Clarke & Co., Cincinnati, Ohio:
 Improved Tally Book for Lumber Dealers. Cincinnati. 1877.

From Claxton, Remsen & Haffelfinger, Philadelphia:
 Practical Treatise on Lightning Protection. H. W. Spang.

From Commissioners of Patents, Washington:
 Annual Report of the Commissioner for 1876. Washington.

From Cooper Union, New York:
 Eighteenth Annual Report of the Trustees. New York. 1877.

From C. D. Elliott, Somerville, Mass.:
 Annual Report, City of Somerville. 1876.

From C. D. Flowers, Columbus, Ohio:
 Tenth Annual Report of the Commissioner of Railroad- and Telegraphs of Ohio, for Year ending June 30, 1876.

From E. A. Fuertes, Ithaca, N. Y.:
 Cornell University Register and Catalogue. 1876-7. (Copies for distribution.)

From C. O. Gleim, Cologne, Germany:
 Extension and Improvement of Rhenish Railway. E. Hartwich. Berlin. 1864. With Maps and Plates.
 Map of Coal Regions at Ruhr.

From T. S. Hardee, New Orleans, La.:
 Report on a special Survey of Lake Pontchartrain. New Orleans. 1876.

From Gen. A. A. Humphreys, Chief of Engineers, U. S. A., Washington:
 Proposals for Iron Work of movable Dam on Great Kanawha River. (2 copies.)
 Specifications as follows: (2 copies.)
 — furnishing Rubble Stone for Bulkhead at Long Point, Provincetown Harbor, Mass.

— Improvement of Illinois River, Ill.; of Penobscot River, Me.; of Pamlico River, N. C. and of Elizabeth, and of Nausemond Rivers, Va.

— Improving Harbor at Black Lake, at Charlevoix, at Frankfort, at Ludington, at Manistee, at Muskegon, and at Pentwater, Mich.; at Green Bay, Wis., and at Norfolk, Va.

From the Institution of Civil Engineers, London, Eng.:
 List of Members of the Institution, June 12th, 1877.

From C. Latimer, Cleveland, Ohio:
 Comparative Statement of Expenses in Engineering Department, Atlantic & Great Western R. R. March, April, 1876-77.

From G. Leverich, New York:
 Proceedings before Committee on Railroads of Assembly of New York, relating to Construction of Steam Elevated Railways in City of New York.

From Macmillan & Co., New York:
 Absorption of Light and the Colors of natural Bodies. Prof. Stokes. London.
 Kinematic Models. Prof. Kennedy. London.
 Outlines of Field Geology. Prof. Geikie. London.

Photography. Capt. Abney. London.
 Sound and Music. W. H. Stone. London.
 Steam Engine. F. J. Bramwell. London.
 Technical Chemistry. Prof. Roscoe. London.

From Massachusetts State Board of Health, Boston:
 Eighth annual Report of the Board. January. 1877.

From F. H. Smith, Baltimore, Md.:
 The Pocket Geologist and Book of Minerals. Baltimore. 1877.

From T. Guilford Smith, Buffalo, N. Y.:
 Proposals for Wrought and Cast Iron Work for U. S. Custom House and Post Office at Chicago. With 9 photographic Sheets of Drawings.

From John D. Van Buren, Jr., Albany:
 Annual Report of State Engineer and Surveyor on the Canals of the State. Albany. 1877.

From J. H. Streidinger, New York:
 The simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses. J. H. Streidinger. (German.) Vienna.

From Van Antwerp, Bragg & Co., Cincinnati, Ohio:
 Elements of agricultural Geology, for Schools of Kansas. W. D. Kedzie. Cincinnati. 1877.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: a *regular* meeting, when ballots for members will be canvassed and other business done, Wednesday, September 5th; and a *stated* meeting, for consideration of professional topics and enjoyment of social intercourse, Wednesday, September 19th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held Wednesday, August 1st, and September 6th, at 3 o'clock P. M.

No regular or stated meetings of the Society will be held from July 12th to September 5th.

LIST OF PAMPHLETS FOR DISTRIBUTION among members of the Society, on hand July 1st, 1877, is herewith presented. Stamps to prepay postage should be sent by those who apply for copies. It will be sufficient to mention the number of title.

Address of A. L. Holley before American Institute of Mining Engineers, at Cleveland.—(1.)

— of A. L. Holley before American Institute of Mining Engineers, at Washington.—(2.)

— of W. J. McAlpine, at Albany, on Public Works of the State.—(3.)

Ashtabula Bridge Disaster. Report of Joint Committee of Ohio Legislature.—(4.)

Catalogue of Scientific Books. *Van Nostrand*.—(5.)

— of Scientific Books. *Wiley*.—(6.)

Cornell University Register and Catalogue.—(7.)

Engineering in Sweden. C. P. Sandberg.—(8.)

Exhibit of Stevens Institute of Technology at Centennial Exhibition.—(9.)

Fisher Rail Joint.—(10.)

Foundation of Washington National Monument. Report of Committee.—(11.)

Geographical Survey in the United States. G. K. Warren.—(12.)

Mississippi River. Improvements of South Pass. Fifth Report. C. B. Comstock.—(13.)

— Improvement of South Pass. Sixth Report. C. B. Comstock.—(14.)

— Report on Jetties on South Pass. J. B. Eads.—(15.)

Rail Sections. Traffic Capacity of Sandberg's Standard —.—(16.)

Sewerage. Report on — for City of Providence.—(17.)

Sewers. Tenth Quarterly Report of Water Commissioners of City of Providence on.—(18.)

Steel Cable Wire for East River Bridge. Specifications.—(19.)

— Price List and Circulars of Chrome Steel Co.—(20.)

Transportation Route along Wisconsin and Fox Rivers. Report by G. K. Warren.—(21.)

Water Department. City of Philadelphia. Annual Report of Chief Engineer for 1875.—(22.)

— Report on the Purification of — upper Harbor of Baltimore. W. J. McAlpine.—(23.)

— Supplies for City of San Francisco. Engineer's Report.—(24.)

— Ways of Europe. Reports by J. G. Barnard, J. W. Adams and S. Stevens.—(25.)

— Works City of Montreal. Report by W. J. McAlpine.—(26.)

— City of Philadelphia. Notes referring to —, from 1801-1815.—(27.)

— for supply of City of Norfolk. Report and Plan, by W. J. McAlpine.—(28.)

INSTITUTION OF CIVIL ENGINEERS, LONDON.
—Referring to "List of Members" of the Institution, issued June 12th, 1877, the following are noted—in addition to names heretofore published (Vol. II, page 171)—as being also members of this Society:

Holley, Alexander Lyman. [M.] New York.

Roberts, William Milnor. [M.] New York.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th next. The conditions of award are set forth in the Code of Rules heretofore published in the Journal; a copy will be furnished to applicants.

No award having been made last year, it is announced that, under Rule VI. two premiums are offered for the coming year, one being a gold medal for the best paper, and the other, books (costing \$70 currency), for the second best paper, competing.

ILLUSTRATIONS OF PAPERS presented for publication should be distinctly drawn in broad, sharp lines, upon white, smooth (not "egg" or enamelled) paper, with perfectly (not glossy, or grey) black ink, to a scale twice or thrice greater than the print is to be; which in no case should require folding in more than one direction (i. e., the depth of plate, as inserted in Transactions, should not exceed 7 inches). Shades are to be produced by variations in size and spacing of black lines; no brush work or colors are admissible. Unless figures and letters can be well put in, simply pencil them, leaving the engraver to insert them on the plate. Always put a lineal scale upon each drawing.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. They are open from 9 o'clock, A. M. to 5 o'clock, P. M. each business day, except Saturday, when they are closed at 3 o'clock, P. M. Members desiring admission outside these hours, should apply to the Secretary.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. August, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JULY 12TH, 1877.—An adjourned regular meeting was held at eight o'clock P. M.

The vote on admission to membership was canvassed, and the following declared elected: Members—John W. Bacon of Danbury, Conn.; Charles E. L. B. Davis of Galveston, Texas; William B. Hyde of Oakland, Cal.; Benjamin F. Morse of Cleveland, Ohio, and Arthur F. Wrotnowski of New Orleans, La.; and Junior, Arthur Macy of New York.

OF THE BOARD OF DIRECTION.

JULY 18TH, 1877.—A special meeting was held at three o'clock P. M. for transaction of regular business. A quorum not being present, no action was taken.

AUGUST 1ST, 1877.—A stated meeting was held at three o'clock P. M., and proposals for admission to membership were considered.

AUGUST 7TH, 1877.—An adjourned meeting was held at ten o'clock A. M.

The Committee appointed* to prepare a form of letter ballot on the resolutions, referred to the Board at the Ninth Annual Convention† and to present statements of reasons for and against the action thereon proposed, made report, which was considered, and referred to the Committee for amendment.

Applications for admission to the Society were taken up, appropriations made, and other business done.

* The Committee consists of Theodore G. Ellis, J. James B. Croes, and Matthias N. Forney.

† Pages 47, 48, 51 and 52.

LIST OF NEW BOOKS ON ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Architecture, Some Account of domestic Architecture in England, from the Conquest to End of Thirteenth Century. T. H. Turner. 2nd ed. London. 8vo. *Parker*. 21s.
- Artillery, Manual for the 64-Pounder rifled M. L. converted Guns of 58 and 71 cwt.s., L. S. (British Government Publication). London. 8vo. 6d.
- Birds, Outdoor common —, their Habits and general Characteristics, with original Illus. of the Birds and their Eggs. Henry Stannard. London. 12mo, illus. *Warne*. 1s. 6d.
- Builder's Clerk, a Guide to the Management of a Builder's Business. Thomas Bales. London. 12mo. *Spons*. (New York). \$0.60.
- Butter and Butter-Making, with the best Methods for Producing and Marketing It. Willis P. Hazard. Philadelphia. 12mo. *Porter & Coates*. \$0.25.
- Bridges, Cable Making for Suspension —, as exemplified in the Construction of the East River Bridge. Wilhelm Hildenbrand. (Van Nostrand's Science Series.) New York. 18mo, illus. (Announcement). \$0.50.
- Carriers of Goods and Passengers by Land and by Water, a Treatise on the Law of —, Joseph K. Angell. 5th ed., rev., cor., and enl., by John Lathrop. Boston. 8vo. *Little, Brown & Co.* \$6.00.
- Chemical Composition of Foods, Water, Soils, Minerals, Manures and miscellaneous Substances. E. T. Kensington. London. 12mo. *Churchill*. 5s.
- Chemistry, an elementary Treatise on practical Chemistry and qualitative inorganic Analysis. Frank Clowes. From 2nd English ed. Philadelphia. 12mo, illus. *Lea*. \$2.50.
- Civil Engineering, an elementary Course of —, for Cadets of United States Military Academy. J. B. Wheeler. New York. 8vo, illus. *Wiley & Sons*. \$4.00.
- Climate and Diseases of North America, being an Appendix to the "Influence of Climate in North and South America," giving Health Statistics of States, Cities, etc., compiled by J. Disturnell. New York. (Announcement). *Wiley & Sons*. \$2.00.
- Coal, a deep Boring for — at Searle, Lincolnshire, and its Bearing on the Question of easterly Limit of Yorkshire Coal Measures, beneath the newer Formations. Edward Hall. With Abstract of Discussion. (Minutes of Proceedings, Institute of Civil Engineers). London. 8vo, illus. *Inst. Civil Engineers*.
- Gas, a practical Treatise on the Manufacture and Distribution of —, William Richards. London. 4to, illus. *Spons*. (New York). \$12.00.
- Colonist, the textile —: a monthly Journal of Bleaching, Printing, Dyeing, &c., ed. by Charles O'Neill. Vol. III. Manchester. 8vo, illus. (*London*. *Simpkin*). 21s.
- Commerce, First annual Report of the Chief of Bureau of Statistics, on the internal — and Navigation of the U. S., for Year ending June 30th, 1876. 2 vols. Washington. 8vo. *Gov. Printing Office*.
- Cotton Manufacturer's Assistant. E. D. Foley. 2d ed. Manchester. 12mo. (*London*. *Simpkin*). 2s.
- Drawing, industrial Courses in — on Machinery, Civil Engineering, ceramic Art and interior Decorations. New York. (Announcement). *Appleton & Co.*
- Dynamics, an elementary Treatise on —, of System of rigid Bodies, with numerous Examples. 3rd ed., rev. and enl. London. 8vo, illus. *Longmans*. (New York, *Van Nostrand*). \$7.50.
- Engineering Magazine, Van Nostrand's Eclectic —. Vol. XVI. January to June, 1877. New York. 8vo, illus. *Van Nostrand*. \$3.00.
- Encyclopaedia Britannica, a Dictionary of Arts, Sciences and general Literature. 9th ed. Vol. VI. Cl.-Day. Edinburgh & Boston. 4to, illus. *Little, Brown & Co.* \$9.50.
- Engineers, Journal of the Hungarian Society of — and Architects. *Buda Pest*. 8vo. illus. (Hungarian).
- Society of —, Transactions for 1876. Ed. by Perry F. Nursey. London. 8vo, illus. *Spons*. (New York).
- Explosives Act, 1875, the Orders in Council and of the Secretary of State under that Act, a Guide for the Use of local Authorities and their Officers. V. D. Majendia. (British Gov. Publication.) London. 2s.
- Ferns of North America, Illustrations of —, Text by Daniel C. Eaton, illus. by James H. Emerton. Part I. Salem. 4to, illus. *Naturalists' Agency*. \$1.00.
- Fisheries, Sea —, E. W. H. Holdsworth. Salmon Fisheries. Archibald Young. London. 12mo. *Standford*. 4s. 6d.
- Fossils, the American paleozoic —, a Catalogue of the Genera and Species, with Names of Authors, Dates, Places of Publication, &c. S. A. Miller. Cincinnati. 8vo, illus. (*Van Nostrand, New York*). \$3.00.
- Founding of Metals, a practical Treatise on Melting of Iron. Edward Kirk. Albany. 12mo, illus. *Kirk*. \$2.00.
- Geometry, descriptive —, Shadows and Perspective. S. Edward Warren. New ed., cond. and comp. New York. 8vo, illus. *Wiley & Sons*. (Announcement). \$3.50.
- Geometry, natural —, an Introduction to the logical Study of Mathematics, for Use of Schools and technical Classes; with explanatory Models based upon the tachymetrical Works of Edouard Lagout. A. Mault. London. 18mo. *Macmillan*, (New York). 2s. 6d.
- Graphical Statics, new Construction in —, Henry T. Eddy. New York. 8vo, illus. *Van Nostrand*. \$1.50.
- Gun Cotton and its Manufacture, Short Notes on —, prepared for the use of Cadets at Royal Military Academy. Woolwich; also on Gunpowder and its Manufacture. H. Geary and W. H. Waddell. (British Gov. Publication). London. 12mo. 1s.

- Industrial Science, Outlines of** —. D. Syme. 2nd ed. London. 8vo. *Henry S. King*. 6s.
- Marine Survey, East India, Report on** —. (Parliamentary.) London. 8vo. 11d.
- Materialism, a History of** —. F. A. Lange. auth. Trans. from the German, by Ernest C. Thomas. 3 vols. Vol. I. (English and Foreign Philosophical Library, Vol. I.) Boston. 8vo. *Osgood*. \$3.50.
- Mechanical Engineers, Proceedings of Institution of** —. May, 1877. London. 8vo, illus.
- Mechanics, Elements of analytical** —, with Examples. De Volson Wood. 2nd. ed., rev. and enl. New York. 8vo. illus. *Wiley & Sons*. \$3.00.
- Merchant and Revenue Marine, and Naval Vessels of the U. S., for Year ended June 30, 1875, and to June 1, 1876. 8th annual Report.** Washington. 8vo. *Gor. Printing Office*.
- Military Artificers' Handbook, prepared in Instruction Branch of the Royal Carriage Department, April, 1877.** London. 32mo, (British Gov. Publication.) 3s.
- Militia, Discipline and Drill of** —. Frank S. Arnold. New York. *Van Nostrand*. \$2.00.
- Minerals of New England, where and how to find Them.** F. T. Bartlett. (Announcement.)
- Mines, Inspector's Reports for 1876.** (British Gov. Publication.) London. 6s. 6d.
- Navigation and nautical Astronomy, a Treatise on** —, supplying Tables in which each Number can be instantly tested or easily and independently calculated. Oliver Byrne. London. 4to. *Bentley*. 42s.
- Ordinance, Treatise on Construction and Manufacture of** — in the British Service. Prepared in the Royal Gun Factory. (British Gov. Publication.) London. 8vo. 18s.
- Paper and Paper Making. Chronology of the Origin and Progress of** —. Joel Munsell, 5th ed., with add. Albany. 12mo. *Munsell*. \$2.00.
- Power, the Transmission of** — a long Distance. Henry Robinson, with Abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. Civil Engs.*
- Perfumes, a Treatise on the Manufacture of** —, and kindred Toilet Articles. John H. Snively. Nashville. 8vo. *C. W. Smith (Van Nostrand, New York)*. \$3.00.
- Plumber, the — and sanitary Houses, a Practical Treatise on the Principles of internal Plumbing Work, or the best Means for effectually excluding noxious Gases from Houses.** S. S. Hellyer. London. 8vo. *Batsford*. 7s. 6d.
- Produce Exchange, New York. Annual Report of Board of Managers of** — — for Year ending June 1st, 1876. S. H. Graut. New York. 8vo. *Produce Exchange*.
- Railroads of the United States, Manual of** —, for 1877-8, showing the Mileage, Stocks, Bonds, Cost, Traffic, Earnings, Expenses, Organizations, etc., with Analysis of Debts of the United States and of the several States. Henry V. Poor. 10th series. New York. 8vo. *H. V. & H. W. Poor*. \$5.00.
- Railway Accidents, Inspector's Reports, 1876. Part B. Returns and Reports, January to March, 1877.** (Parliamentary Reports.) London. 8vo, illus. 2 Numbers. 4s. and 9s.
- **Rights, Realities and Personalities, a general Classification of** —; designed to facilitate the Work of Taking an accurate Inventory of such Property. George T. Balch. New York. Folio.
- Railways. Continuous Brakes. Correspondence.** (Parliamentary Reports.) London, 8vo. 4d.
- **Use of mechanical Power on Tramways.** Parliamentary Report of select Committee, with Evidence. London. 8vo. 2s. 9d.
- Rainfall, British—, The Distribution of Rain over the British Islands, during 1876.** C. J. Symons. London. *Stanford*. 5s.
- Rocks, a Guide to the Determination of** —, being an Introduction to Lithology. E. Jauncey. Trans. from the French by G. W. Plympton. New York. 12mo, illus. *Van Nostrand*. (Announcement.)
- Sailors' Pocket Book.** F. G. D. Bedford. 3d ed., rev. and enl. Portsmouth. 16mo. *Nimble*. (London) 7s. 6d.
- Sanitary Condition of Dwelling Houses in Town and Country.** George E. Waring, Jr. New York. 18mo, illus. (Van Nostrand's Science Series.) (Announcement.) \$0.50.
- Sewerage. Report of joint special Committee on improved** —. Boston. 8vo.
- — on the —, of City of Quincy. McRitchie & Nichol. Milwaukee. 8vo.
- Ships of War (European) —, and their Armament, Naval Administration, Economy, Marine Constructions, Appliances and Dock Yards.** J. W. King, U. S. N. 8vo, illus. Washington. *Gor. Printing Office*.
- Sound, the Theory of** —. John Wm. Strutt. Vol. I. London. 8vo. *Macmillan*, (New York). \$4.50.
- Stenography, a brief History of the Art of** —, with a proposed new System of phonetic Shorthand. William P. Upham. Somerville. 8vo. *Essex Institute*. \$1.25.
- Strains, the Theory of transverse Strains and its Application to the Construction of Buildings, including a full Discussion of the Theory and Construction of Floor Beams, Girders, Headers, Carriage Beams, Bridging, rolled Iron Beams, tubular Iron Girders, Cast-iron Girders, framed Girders, and roofed Trusses; with Tables, calculated expressly, of the Dimensions of Floor Beams, Headers, and rolled Iron Beams; also showing Results of original Experiments on tensile, transverse and compressive Strength of American Woods.** R. G. Hatfield. New York. 8vo. *Wiley & Sons*. \$6.00.
- Village Improvements and Farm Villages.** George E. Waring, Jr. Boston. 18mo, illus. *Osgood*. \$0.75.
- Water Board. First Annual Report of the Boston —, for Year ending April 30th, 1877.** Boston. 8vo.
- **Supply Engineering, a practical Treatise on** — —, relating to the Hydrology, Hydrodynamics, and practical Construction of Water Works in North America, with numerous Tables. John T. Fanning. New York. 8vo, illus. *Van Nostrand*. \$6.00.
- — of small Towns and Villages.
- Hints on.** L. L. Macassey. London. 8vo. *Spens*, (New York). \$1.50.
- Weighting and Measuring, the Science of** — —, and Standards of Measure and Weight. H. W. Chisholm. London. 12mo, illus. *Macmillan*, (New York). 4s. 6d.

ADDITIONS TO LIBRARY AND MUSEUM.

From American Institute of Architects, New York:
Constitution and By-Laws, of the Institution, September, 1876.

From A. Ambrozovics, Buda Pest, Hungary;
Photographs of Bridges and Buildings in Hungary. 6 pictures.

From Association of Civil Engineers and Architects of Mexico, Mexico:
Address delivered for the Association, on election to its Presidency, by F. de Geray. Mexico. 1877.

From George T. Balch, New York:
A general Classification of Railway Rights, Realities and Personalities. George T. Balch. New York. 1877.

From William S. Barbour, Cambridgeport, Mass.:
Eighth annual Report of State Board of Health of Massachusetts, January, 1877. Boston.

From Boston Public Library, Boston, Mass.:
Bulletin No. 42, July, 1877.
Twenty-fifth annual Report, Boston Public Library. 1877.

From Henry C. Carey, Philadelphia:
Resumption, when and how will it end? Letters to President of the U. S. H. C. Carey. Philadelphia.

From J. James R. Croes, Yonkers, N. Y.:
Department of Public Parks. Report of Civil and Topographical Engineer and the Landscape Architect accompanying a Plan for local Steam Transit Routes in 23d and 24th Wards, New York. (Additional copies for distribution.)

From Joseph P. Davis, Boston, Mass.:
First annual Report of the Boston Water Board for Year ending April 30th, 1877. (2 copies.)

Report of joint special Committee on improved Sewerage. Boston. 1877. (2 copies)

From Gen. Quincy A. Gillmore, New York:
Foundation of the Washington National Monument. (Additional copies for distribution.)

From S. H. Grant, Supt. Produce Exchange, New York:
Annual Report of New York Produce Exchange for Year ending June 1st, 1876. New York. 1877.

From R. G. Hatfield, New York:
Theory of transverse Strains and its Application in the Construction of Buildings. R. G. Hatfield. New York. 1877.

From R. Hoe & Co., New York:
Descriptive Catalogue of Printing Presses. R. Hoe & Co. New York.

From Gen. A. A. Humphreys, Chief of Engineers, U.S.A., Washington, D.C.:
Fifth and Sixth Reports upon the Improvement of the South Pass of the Mississippi River. Separate numbers. (Additional copies for distribution.)

From Hungarian Society of Engineers and Architects, Buda Pest, Hungary;
Journal of the Society—from January, 1877.

From Institution of Civil Engineers, London:
Deep Boring for Coal at Searle, Lincolnshire. Edward Hall, with Abstract of Discussion, (Excerpts from Minutes of Proceedings.) London. 1877.

Transmission of Power, a long Distance. Henry Robinson, with Abstract of Discussion. (Excerpts from Minutes of Proceedings.) London. 1877.

From Institution of Mechanical Engineers, London:
Proceedings of the Institution, May, 1877. London.

From Long Island Railroad Co., Brooklyn, N. Y.:
Long Island, and where to go. New York, 1877.

From MacRitchie and Nichol, Milwaukee, Wis.:
Report on the Sewerage of City of Quincy, Ill. Milwaukee. 1877.

From R. J. Morrison, New York:
The City Record. 6 parts. New York. 1876.

From Joseph Nimmo, Jr., Washington:
First Annual Report on internal Commerce of the United States. Washington. 1877.

From H. V. and H. W. Poor, New York:
Manual of the Railroads of the United States for 1877-78. New York. 1877.

From W. S. Schock, Engineer-in-chief, U. S. Navy, Washington:
Report of Chief Engineer J. W. King, U. S. Navy, on European Ships of War, their Armaments, &c. Washington. 1877.

From John Sherman, Secretary of Treasury, Washington:
Annual Report of Chief of Bureau of Statistics on Commerce and Navigation of the U. S. for Year ending June 30, 1876. Washington.

From T. Guilford Smith, Buffalo, N. Y.:
Proposals for wrought and cast Iron Work for United States Custom House and Post Office at Cincinnati, also at Chicago, with 11 Sheets of photographed Drawings. Washington.

From Society of Engineers, London:
Transactions for 1876. Ed. by P. F. Nuresey, Secretary. London. 1877.

From Frank H. Taylor, Philadelphia:
American Society of Civil Engineers, 1877. Illustrated Record of the southern Excursion. F. H. Taylor. Philadelphia. 1877.

From D. Van Nostrand, New York:
Magnetism of Iron Vessels, with a short Treatise on terrestrial Magnetism. Fairman Rogers. New York. 1877.
Strength and Calculations of Dimensions of Iron and Steel Constructions, with Reference to latest Experiments, trans. from German of J. J. Weyrauch. New York. 1877.

From H. F. Walling, Boston, Mass. :
Appalachia. June, 1877. Boston. (2 copies.)

From B. Westerman & Co., New York :
Catalogue of German, English, American and
French Periodicals. Parts I, II. New York.

From miscellaneous Sources :
Encyclopædia Britannica, a Dictionary of
Arts, Sciences and general Literature.
Ninth Ed., Vol. VI., Ch-Day. Boston.
1877.

Industrial Art Education. (An Address by
Walter Smith, in Philadelphia, April 23d,
1875.)

Report of Joint Committee concerning the
Ashtabula Bridge Disaster, Ohio Legisla-
ture. Columbus. 1877. (Additional cop-
ies for distribution.)

Silver as a Commodity, as Money and as a
material for Tokens, Coins, or fractional
Currency. W. D. Kelley. Philadelphia.
1877.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for remainder of
the Society year, will be held as follows: *regu-
lar* meetings, when ballots for members and
upon resolutions submitted to vote, will be
canvassed, and other business done, Wednes-
day, September 5th and October 3d; and *stated*
meetings, for consideration of professional
topics and enjoyment of social intercourse,
Wednesday, September 19th and October 17th,
each at eight o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION
during the same term, for the transaction of
regular business, will be held Wednesday,
September 5th, and October 3d, at three
o'clock P. M.

No regular or stated meetings of the So-
ciety, will be held from July 12th to Sep-
tember 5th.

PAPERS HAVE BEEN PRESENTED, not previ-
ously announced, as follows :

Failure of the Ashtabula Bridge, a Discussion.

W. Milnor Roberts.....April 5th, 1877.
Eye-Bar Heads, a Discussion.

C. Shaler Smith.....June 2d, 1877.
Consideration of the Impact of a falling Body.

Charles H. Haswell.....June 10th, 1877.
On a new Type of Steam-Engine, theoretically
capable of Utilizing the full mechanical
Equivalents of Heat Energy, and on some
Points in Theory, indicating its Practi-
cability.

Robert H. Thurston.....July 13th, 1877.
Report at the Ninth Annual Convention of E.
L. Cortbell, on the Mississippi River, a Dis-
cussion.

William H. Seales.....July 27th, 1877.

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miums are offered for the coming year, one

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the other, books (costing \$70 currency), for
the second best paper, competing.

PAPERS ON ENGINEERING SUBJECTS, giving
results of practice, or in discussion of per-
tinent theoretical questions, are desired from
members of the Society; their comments
(whether or not present at meetings of the
Society), upon papers published in *Transac-
tions*, are solicited, and they are urged to con-
tribute from note-books and other similar
records, whatever may bear upon the sub-
jects considered, or refer to other practical
topics. A list of subjects relating to the prac-
tice of engineering and its connection with
kindred art and public affairs, on which
papers are desired, may be found on page 51,
Vol. I.

ILLUSTRATIONS of PAPERS presented for
publication should be distinctly drawn in
broad, sharp lines, upon *white, smooth* (not
"egg" or enamelled) paper, with perfectly
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East Twentieth street, one door east from
Fourth avenue, and near southwest corner of
Gramercy Park. They are open from 9
o'clock, A. M. to 5 o'clock, P. M. each business
day, except Saturday, when they are closed
at 3 o'clock, P. M. Members desiring admis-
sion outside these hours, should apply to the
Secretary.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election
BACON, JOHN W. Danbury, Conn.	July 12, 1877.
BENSON, FREDERICK S. Engineer Nassau Gas Light Co., Brooklyn, N. Y.	Feb'y 7, 1877.
DAVIS, CHARLES E. L. B. Lieut. of Engineers, U. S. A., Galves- ton, Texas.	July 12, "
MACY, ARTHUR, [J.] 159 Henry st., New York.	" "
MORSE, BENJAMIN F. City Civil Engineer, Cleveland, Ohio.	" "

CHANGES AND CORRECTIONS.

BAXTER, GEORGE S.	(Care Am. Soc. Civil Engs.), 104 East Twentieth st., New York.
BLAND, JOHN C.	530 Walnut st., Philadelphia, Pa.
BROOKS, THOMAS B.	Box 298, Newburgh, N. Y.
COOPER, THEODORE.	(Care Delaware Bridge Co.), 52 Wall st., New York.
DUBARRY, EDMUND L.	Supt. C. D. & V. R. R., Chicago, Ill.
DUBOIS, AUGUSTUS JAY.	Prof. Dynamical Engineering, Sheffield Scientific School, Yale College, New Haven, Conn.
DURHAM, C. WHEELER.	166 Pine st., Chicago, Ill.
FINK, ALBERT.	346 Broadway, New York.
FLINT, EDWARD A.	(Care B. Kimball), 14 Sears Building, Boston, Mass.
GUNN, WILLIAM A.	Lexington, Ky.
HILTON, CHARLES.	105 Lancaster st., Albany, N. Y.
HJORTZBERG, MAX.	387 North La Salle st., Chicago, Ill.
HORTON, SANDFORD.	Div. Eng. C., C. & B. H. R. R., Covington, Dakota Co., Neb.
JORDON, GABRIEL.	Vice-Pres. and Gen. Mang. H. & T. Cen. R. R., Houston, Texas.
KENNEDY, JOHN C.	Florence, N. J.
NICHOLS, OTHNIEL F.	141st st., near Willis Av. (Morrisania), New York.
PICKETT, WILLIAM D.	Helena, Mon.
RICE, EDWARD C.	3631 Baker Av., St. Louis, Mo.
SEARS, ALFRED L.	Chimbotu, Peru.
SMITH, ISAAC W.	(Care Williams & Thornton), San Francisco, Cal.
STUCKLE, HENRY W. DE.	(Care William E. Worthen), 63 Bleecker st., New York.
TASKER, CHARLES A.	Res. Eng., C. S. R. R., North Tower, Jessamine Co., Ky.
VINTON, FRANCIS L.	Denver, Col.

DECEASED.

COOKE, ROBERT L.	New York.	Aug. 11, 1877.
EMACK, CHARLES E.	Culpepper, Va.	July 27, "
OGDEN, WILLIAM B. [F.]	New York.	Aug. 3, "

American Society of Civil Engineers.

PROCEEDINGS.*

Vol. III. September, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 5TH, 1877.—A regular meeting was held at eight o'clock P. M.

The vote upon admission to membership was canvassed, and the following declared elected: Members—John B. Atkinson of Earlington, Ky.; Charles B. Brush† and Arthur Spielmann‡ of Hoboken, N. J.; George M. Frazell and James A. Hayward of Galveston, Texas; Philip Golay of Cincinnati, O.; Thomas H. Johnson of Columbus, O.; H. W. Parkhurst of Louisiana, Mo.; and Clinton F. Stephens of Dallas, Texas; Associate—Alfred G. Compton of New York; and Junior—William D. Bullock of Providence, R. I.

The deaths of members were announced, as follows: Louis Nickerson, late of Baltimore, a Member from October 29th, 1872, died May 6th; Charles S. Emack, late of Culpepper, Va., a Member from January 24th, 1872, died July 26th; William B. Ogden, late of New York, a Fellow since March 24th, 1878, died August 2d; Robert L. Cooke, late of New York, a Member since October 23d, 1872, died August 11th, and Henry Tyson, late of Baltimore, a Member since July 13th, 1872, died September 2d; and it was moved that a committee be appointed for each, to prepare a memoir of the life and professional services of the deceased.

Letters were read from the Austrian Commission for the International Exhibition at Philadelphia, the Minister of Public Works of Prussia, and the Swedish Society of Engineers, thanking this Society and its members

* Up to October 9th, 1877. † Became Associate, September 28th, 1871. ‡ Became Associate, August 29th, 1873.

for courtesies shown foreign engineers who visited this country during the Exhibition ; from Charles E. Billen, describing a drawing-board for use in the field ; from Robert Briggs, in regard to apparent discrepancies in "Report on Means of averting Bridge Accidents," presented by James B. Eads, and C. Shaler Smith,* and from J. Foster Flagg, describing a peculiar roof truss.

The following amendment to the Constitution, recommended by the Board of Direction for adoption by the Society, was offered and action thereon deferred to a subsequent meeting :

ARTICLE —. Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

These papers were presented · "Design for a Steam Vacuum Pump," by William H. Lotz, M. E. of Chicago, Ill. ; "Cushioning the reciprocating Parts of Steam Engines," by John W. Hill, M.E. of Hamilton, O., and on "Levees, a Discussion," by J. Foster Flagg, C. E. of Meadville, Pa.

The Chairman of the Committee on Library raised the question, that as the Committee had decided Mr. Lotz's paper to be of a class which should not be published by the Society (it being the description of a structure which had not been built), whether it was proper to be read at a meeting of the Society. The question was discussed, and on motion, the paper was laid on the table.

The Society adjourned to meet September 19th, 1877, for the transaction of regular business.

SEPTEMBER 19TH, 1877.—A stated and adjourned regular meeting was held at eight o'clock P. M.

The amendment to the Constitution offered at the meeting, September 5th, was taken up and formally submitted to the Society for adoption.

A communication from Clemens Herschel,† to voting members of the Society, as to the ballot upon the resolutions referring to the adoption of the metric standards, before the Society, was read.

Charles E. Emery, C. E., of New York, gave a continuation of his Paper‡ on "Relative Quantities of Material in Bridges of different Kinds, of various Heights."

OCTOBER 3D, 1877.—A regular meeting was held at eight o'clock P. M.

The vote closing this day, upon the following resolutions, as submitted to letter ballot, was canvassed.

I.—Resolved, that a committee of five, whose names shall be selected by letter ballot, shall be appointed to draft a law covering the points outlined on pages 125, 126, 127, 128, Transactions, May, 1875, adding thereto the necessary provisions to secure the inspection by experts of all questionable bridges now in existence.

* Transactions, Vol. IV, page 122, &c. † Page 91. ‡ Transactions, Vol. VI, page 235.

And further, that this law, so drafted, shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to the Society for letter ballot, and, if approved, that printed copies of the said law and the accompanying resolution be sent to the members of the Society, with a request that they move actively, each in his own State, towards procuring the passage of the specified law by the various State Legislatures during the coming winter.*

ARGUMENT FOR.—1. The prevention of bridge accidents is more desirable than arrangements for sitting in judgment on them after they occur.

2. As the National Legislature has for some time been passing laws for the protection of life on the navigable waters of the United States, so, sooner or later, will the question of the proper construction of railways be taken up and legislated upon.

3. Many mistakes are made in laws, owing to ignorance on the part of those passing them, and the undue influence of interested inventors and manufacturers.

4. As laws regulating the construction of bridges and railroads will certainly be passed, and official positions will assuredly be created by them, it is far better that this Society should take time by the forelock, dictate a law which shall be just and equitable, and hold control of the appointments under it, than that it should stand in the back-ground until an aroused public opinion compels legislation which may be injurious to the profession, especially if enforced by political appointees who may be utterly unfit to hold such positions. All laws are written by some one, and the greater the knowledge of the subject matter on the part of the person is, the more probable is the production of a good and wise statute.

5. The fixing of the standard as proposed, the preparation of such a law as suggested, and the professional surveillance of the appointees under it, are eminently the province of this association; and all legislation on the subject should be both inspired and dictated by this Society, which is the most competent authority in the premises.

ARGUMENT AGAINST.—The resolution is objectionable:

1. As to mode of appointment of the committee to draft a law. A committee of five

cannot well be appointed by letter ballot. No provision is made for any mode of nomination of the members, and unless some interested parties electioneer for certain nominees, the probability is great that there will be a very scattering vote, and no one be chosen except after several ballots, a mode of procedure both dilatory and expensive. The principle, too, is contrary to the established rule in deliberative bodies, that such committees should be named by the presiding officer, who is assumed to be impartial and to know who are experts in certain branches better than do the mass of voting members.

2. As regards the *policy of the Society*. The Society, as a body, is not competent to set forth opinions on any special points of practice. It is not an association of bridge experts alone, nor is a majority of its members qualified to sit in judgment on the questions involved in bridge construction. The tendency of the proposed action would be to place the Society in a false position before the public, by making it appear that the views of a few persons were supported by a large body of scientific men, whereas, in fact, a large majority of that body is engaged in occupations altogether different from the one under consideration, and the votes of that majority will really not be based on any conviction. One prominent point in the scheme proposed, is the appointment by the Society of the experts to examine bridges. A full discussion has been had on this question, which resulted in the adoption by the Annual Convention of 1875 of a resolution declaring that it was inexpedient. The action now proposed is an effort to revive an issue which was supposed to be disposed of satisfactorily to the majority of the members.

3. The members of this Society are not supposed to be experts upon questions of law.

Upon this resolution there were 32 votes yes, 86 votes no, and 1 blank.

II.—Resolved, that a committee of five whose names shall be selected by letter ballot, shall be appointed to draft a law requiring tests of

* Proposed by C. Shaler Smith, page 45. † See Vol. 1, page 260, &c.

finished bridges before, and at stated times after, their opening for public travel.

And further, that this law so drafted shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to this Society for letter ballot, and if approved, that printed copies of the said law and the accompanying resolution to be sent to the members of the Society, with a request that they move actively, each in his own State, toward procuring the passage of the specified law by the various State Legislatures during their next session.*

ARGUMENT FOR.—If it be considered unadvisable to put legal restrictions upon the construction of bridges, then it may be advisable to provide for the testing of such bridges as may be built.

ARGUMENT AGAINST.—The subject matter of this resolution appears to be embodied in the previous one of C. Shaler Smith, and the two subjects, it appears, should be considered together.

Upon this resolution, there were 24 votes yes, 90 votes no, and 5 blank.

III.—Resolved, that the form of memorial submitted† be adopted by the Society, be signed by the President and Secretary, and transmitted to the two Houses of Congress.‡

ARGUMENT FOR.—Inasmuch as the proposed reform has been chiefly advocated by bodies of physicians, druggists, teachers, apothecaries and chemists, together with a few architects, engineers and men of science, principally professors in our institutions of learning, it would add great weight to the proposed enforcement of the metric system if some respectable body of practical men like the American Society of Civil Engineers, would advocate its general adoption.

Although the proposition in the "memorial" differs from what the Committee were instructed by the Society to prepare, yet the change became necessary, as there exists no "Office of Weights and Measures at Washington" in which the metric standard could be adopted, and it would not do for the advocates of a new system of weights and measures to appear to be ignorant upon so vital a point.

The Committee, therefore, being unable to prepare a memorial in furtherance of the adoption of the metric standards in an office

which has no existence, has made the best substitute which their view of the subject suggested.

ARGUMENT AGAINST.—The memorial is objectionable, because :

1. The first clause states a simple fact, but the statement is so made as to create a false impression. While it is true the opinion is widely received that the metric system will eventually supersede the present, it is also true that the contrary opinion is more widely received.

2. The last clause is altogether different from what the Committee was directed by the Society to ask for. It substitutes for the expressed wish of the Society, a much more comprehensive and sweeping wish of the Committee. The action asked for would require all census reports, statistical documents and the *Congressional Record* to be translated before issue, into a tongue unknown to the general public and a majority of professional men, and would forbid the use of any explanation of that tongue, in the documents.

Upon this resolution, there were 18 votes yes, 96 votes no, and 5 blank.

IV.—Resolved, that a committee of five be appointed by the President, to consider and report upon what is the best system of weights and measures, for the use of engineers in the United States; that this committee have power to confer with committees from other societies for a like purpose, and that the foregoing be submitted to this Society, to be acted upon by letter ballot.‡

* Proposed by Clemens Herschel, page 46.
page 48.

† Page 47.

‡ Proposed by Theodore G. Ellis,

ARGUMENT FOR.—Before this Society advocates the adoption of any particular new system of weights and measures, it is desirable to ascertain, if possible, what is the best system for engineers, independent of what is best for physicians, apothecaries and men of science generally.

It is desirable to have a committee which can investigate and report, so that the Society may be informed as to the wisdom of these

conclusions and discuss any project proposed, without committing the Society as a body.

It is also desirable to have a committee which can correspond with any home or foreign society having the same object in view.

ARGUMENT AGAINST.—The resolution calls for an immense and expensive undertaking by individuals, for whose labors no compensation is provided.

Upon this resolution, there were 47 votes yes, 70 votes no, and 2 blanks.

V.—(As proposed.) Resolved, that the reading of papers on engineering subjects shall not form part of the proceedings of the Society at the regular meetings held during its Annual Conventions, and that special meetings, for the purpose of hearing and discussing such papers, may be held during the Conventions only when authorized by a two-thirds vote of members of the Society present at one of the sessions of the Convention.*

(As amended by proposer.) Resolved, that papers on engineering subjects shall not be read at the regular sessions of the Annual Conventions, unless they pertain to subjects previously announced for discussion during such sessions; but special sessions may be called for the purpose of hearing and discussing such papers as do not fall within this class, when approved by a two-thirds vote of those present at any regular session.

ARGUMENT FOR.—One principal object of the Annual Convention is to afford facilities for social intercourse and interchange of views among members who during the rest of the year are widely separated. The reading of long papers containing matter not previously presented for consideration is not favorable to the accomplishment of this object. No matter how able a paper may be, its full scope can not be grasped by a person listening for the first time to its oral presentation, particularly if it contains much mathematical discussion.

If however, any work has been done, or discovery made, which is of absorbing interest, a special session can be called by a two-thirds vote, to hear it described and discussed.

ARGUMENT AGAINST.—The first part of the

resolution is unnecessary, being fully covered by the rules for the government of Conventions, adopted December 2d, 1874.†

The second part is both unnecessary and unjust. The two thirds rule proposed, might prevent the consideration of a subject which would be of interest to at least half of the members present.

The multiplication of written and rigid rules for governing the Convention, is to be avoided. As the laws now stand, no one is compelled to listen to what does not interest him, nor is any one debarred the privilege of attending to what does interest him.

The existing rule above referred to, would, if enforced by the officers of the Convention, cut off tedious debate more effectually than the one now proposed.

Upon this resolution, there were 25 votes yes, 90 votes no, and 4 blank.

VI.—Resolved, that the Conventions of the Society be divided into three sections, and that the professional papers be read before the several

* Proposed by W. Sooy Smith, page 51. There being some ambiguity in the form of this resolution—as there are no papers read at the “regular meetings held during its Annual Convention”—it was thought best by the Board of Direction to confer with the author, and he submitted August 14th, 1877, the amended form of the resolution for action. † Vol. I, page 172.

sections, as they may be appropriate ; that the Convention shall adjourn from time to time, to give sections time for their meetings, and that the members, writing papers be required to indicate to what sections they pertain.*

ARGUMENT FOR.—1. Such a division would have the advantage that it would enable members, who attend the Convention, to hear those papers and discussions only, which pertain to subjects in which they are interested, without being obliged to spend much time and endure more or less fatigue in listening to matters in which they are not concerned.

2.—There is seldom sufficient time, at the Conventions, to hear more than a small portion of the papers and discussions appointed for such occasions, and by *dividing* into sections, the effect would be to *multiply* the time which can be devoted to each.

3.—Allowing members the privilege of hearing subjects, with which they are not familiar, discussed by experts, is not usually a great advantage.

4.—The practice in the meetings of other scientific societies, of separating into sections, indicates that experience has demonstrated its advantages, when the topics discussed cover a wide range, as they do, in the meetings of a Society of Civil Engineers.

ARGUMENT AGAINST.—1. The resolution is too vague, not specifying the object of the "sections."

2.—It is too precise, limiting the "sections" to three.

3.—The simultaneous meeting of different sections will debar many members from hearing discussions, in which they are interested.

4.—It provides a rigid law for what had better be left to the Convention to arrange for itself, if it should feel so inclined.

Upon this resolution there were 17 votes yes, 96 votes no, and 6 blank.

Mr. Croes offered for consideration at the Annual Meeting, the following, with the remark that it was but a statement of what the Secretary had done the past four years.

Resolved,—the duties of the Secretary are as follows :—

He shall attend all meetings of the Society, Board of Direction and Standing Committees and record the proceedings.

He shall report and collate discussions on professional topics, conduct the correspondence, edit the publications and superintend the printing of the Society, issue all notices, make the collections, keep the books of account, countersign all bills and receipts, prepare monthly estimates of expenditures for appropriation by the Board of Direction, and present the vouchers for inspection and approval.

He shall be the Librarian of the Society, have charge of the Library and see that all books are marked with the name of the Society and recorded in a catalogue.

He shall have charge of the Society's house or rooms, and whenever practicable, shall reside on the premises.

He shall make an annual report to the Board of Direction at the Annual Meeting, with an inventory of the Society's possessions, (except its funds,) shall engage and be responsible for all assistants employed by him—and generally ;—

He shall conduct the ordinary business of the Society, with the advice and under the instruction of the Standing Committees in reference to their respective departments, and as the Board of Direction may from time to time prescribe.

* Proposed by Caleb G. Forshey, page 52.

The Society adjourned to meet Thursday, October 18th, for the transaction of regular business; the stated meeting to be held at the same time.

OF THE BOARD OF DIRECTION.

SEPTEMBER 5TH, 1877.—A stated meeting was held at eleven o'clock A. M.

Applications for admission to the Society were taken up and other business was done.

OCTOBER 2D, 1877.—An adjourned meeting was held at ten o'clock A. M.

A report from the Committee to nominate officers of the Society for year 1877-8, was presented and acted upon; applications for admission to the Society were considered and other business was done.

NOTES AND MEMORANDA.

ADOPTION OF THE METRIC STANDARDS.

A CARD* TO THE VOTING MEMBERS of the American Society of Civil Engineers:

Your attention is respectfully invited to two facts, viz.:

1st. The Committee which submitted, at the Ninth Annual Convention at New Orleans, the draft of a memorial relative to metric weights and measures, was appointed under the following resolution:

"Resolved, that the American Society of Civil Engineers will further, by all legitimate means, the adoption of the metric standards in the Office of Weights and Measures at Washington, as the sole authorized standards of weights and measures in the United States; that the Chair appoint a committee of five to report to the Society a form of memorial to Congress in furtherance of the object expressed, and that the foregoing be submitted to the Society and voted on by letter ballot."

So far as the Chairman can judge, he fully believes that the members of the committee

* From Clemens Herschel, Chairman, and approved by Robert Briggs and Frederick Brooks, members of Committee on the Metric System of Weights and Measures.

were unanimous in the opinion that it was their duty to report a form of memorial suitable for presentation to Congress; a memorial whose adoption by the American Society of Civil Engineers would further the adoption of the metric system as sole standard in the United States, and that all means proposed to be employed by the Society must be legitimate.

2d. The United States standard weights and measures are preserved in the United States Coast Survey Office, Bureau or Office of Weights and Measures, in charge of J. E. Hilgard. In a letter of November 19th, 1875, Prof. Hilgard writes: "About the functions of the Office of Weights and Measures in Washington, I will write next week:" and in a letter, November 21st, 1875: "The United States Office of Weights and Measures owes its existence to the fact," &c., and "this Bureau or Office is thus a branch of the Treasury Department, and a part of the Coast Survey Office."

CLEMENS HERSCHEL,

Member, American Society

of Civil Engineers.

Boston, Sept. 7th, 1877.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Aerial World, a popular Account of the Phenomena and Life of the Atmosphere. C. Hartwig. New ed. London. 8vo. Longmans, 10s. 6d.

Animals, the Fur-Bearing.—of North America. Elliott Coues, Boston. *Estes & Lauri* t. (Announcement.)

Archaeological Researches. Excavations at Carnac (Brittany): a Record of — in the Bossenno and the Mont Saint Michel. J. Miln. Edinburgh.

— Historical and descriptive Account of the old Stone Crosses of Somerset. C. Pooley. London. 8vo. illus. Longmans, 3s.

- Architect. Notes and Sketches of — in the Northwest of Europe. Felix Narjoux. Boston. 8vo. illus. *Osgood*. \$3.00.
- Architecture. Lectures on — E. Viollet le Duc. Trans. from the French, by B. Bucknell. Vol. I. London. 8vo., illus. *Low & Co.* 31s. 6d.
- Art applied to household Furniture. Harriet P. Spofford. New York, illus. *Harpers*. (Announcement.)
- , a Sketch of its History, Theory, Practice and Application to Industry. M. D. Wyatt, London. 8vo. *Macmillan & Co. (New York.)* 5s.
- Astronomical Observatory at Harvard College. Annals of —. Vol. VIII. Results of Observations made or directed by W. C. Bond, G. P. Bond, and J. Winlock. Part 1. Historical Account of the Observatory from October, 1855, to October, 1876. Part 2. Astronomical Engravings of the Moon, Planets, etc., and illustrating Solar Phenomena. Boston. *Ginn & Heath*. (Announcement.)
- Boilers. Deterioration of —. Evidence before Committee. (Parliamentary Report.) London. 8vo. 11s.
- Botany, the different Forms of Flowers on Plants of the same Species. Charles Darwin. English Reprint. New York. 12mo. *Scribner, Welford & Armstrong*. (Announcement.) \$6.00.
- Butterflies of North America. W. H. Edwards. Vol. I. New York. 4to, illus.
- Calculus, differential —. J. M. Rice. New York. *Wiley & Sons*. (Announcement.)
- Canals. Annual Report of the State Engineer and Surveyor on the — of State of New York. Feb. 15, 1877. Albany. 8vo. maps.
- , Suez —. Further Papers. (Parliamentary Report.) London. 8vo. 2 Parts. 1s. 2d.
- Catalogue. The Publishers' Trade-List Annual for 1877, preceded by the first provisional Supplement to the American Catalogue (being a Reference List of Books recorded in *Publishers' Weekly* from July 1, 1876, to June 30, 1877, with additional Titles, Corrections, Changes of Price and Publishers, etc.), and the American educational Catalogue for 1877: 5th year. New York. 8vo. *Publishers' Weekly*. \$1.50.
- Caves. Notes on the Barrows and Bone Caves of Derbyshire, with an Account of a Decent into Eldon Hole. R. Penington. London. 8vo. *Macmillan & Co. (New York.)* 6s.
- Census of Massachusetts, 1875, prepared under Direction of Carroll D. Wright. 3 Vols. I. Population and social Statistics. II. Manufactures and Occupations. III. Agricultural Products and Property. Boston. 8vo.
- Centennial Exhibition of 1876. General Views of the United States Government Building and Contents. S. C. Lyford, Ordnance Department, U. S. A. Boston. 4to, illus. *Osgood & Co.*
- Official Reports of the International Board of Judges. Ed. by Francis A. Walker. Group II. Pottery, Porcelain, etc. \$1.50. —Group V. Fish and Fishing Products, etc. \$0.25. —Group VI. Timber, Lumber, etc. \$0.25. —Group VII. Furniture, Upholstery, etc. \$0.25. —Group VIII. Cotton Fabrics, etc. \$0.50. —Group XI. Jewelry, etc. \$0.25. —Group XIII. Printing, Stationery, etc. \$0.50. —Group XVI. Military and Sporting Arms, etc. \$0.50. —Group XIX. Vessels and Apparatus of Transportation, etc. \$0.25. —Group XXII. Sewing Machines, etc. \$0.50. —Tests of Turbine Water Wheels. \$0.25. —Tests of Steam Boilers. \$0.25. —Trial of Steam Fire Engines. \$0.25. Philadelphia. 8vo. *Lippincott & Co.*
- Official Reports of the International Board of Judges. Ed. by Francis A. Walker. Group I. Minerals, etc. \$1.50. —Group III. Chemistry and Pharmacy. \$1.50. —Group IV. Animal and Vegetable Products. \$1.50. —Group IX. Wool and Silk Fabrics, etc. \$1.00. —Group X. Clothing, fancy Articles, etc. \$0.75. —Group XII. Leather, Boots, etc. \$0.75. —Group XIV. Apparatus for Heating, etc. \$1.00. —Group XV. Builders' Hardware, etc. \$0.25. —Group XVII. Carriages, etc. \$0.25. —Group XVIII. Railway Plant, Rolling Stock, etc. \$1.25. —Group XX. Motors, etc. \$1.50. —Group XXI. Machine Tools, etc. \$0.25. —Group XXIII. Agricultural Machines, etc. \$0.75. —Group XXIV. Instruments of Medicine, Surgery, etc. \$1.00. —Group XXV. Musical Instruments, etc. \$1. —Group XXVI. Agriculture and Engineering. \$0.75. —Group XXVII. Plastic and graphic Art. \$0.75. —Group XXVIII. Education and Science. \$1.00. —Group XXIX. Horticulture. \$0.25. —Groups XXX to XXXV. Live-Stock. \$0.75. —Group XXXVI. Pomology. \$0.25. —Collective Exhibits. \$0.25. Philadelphia. 8vo. *Lippincott & Co.* (Announcement.)
- Reports of British Commission. (Parliamentary.) London. 8vo. 1 Vol. texts. 1 Vol. plans. 11s. 6d.
- Ceramic Art, a History of —, a descriptive and philosophical Study of the Pottery of all Ages and all Nations. Albert Jacquemart. New ed. New York. 8vo. illus. *Scribner, Welford & Armstrong*. \$10.50.
- Chemistry, inorganic —, for Students in elementary Classes of the Science and Art Department. W. B. Kemshead. (Collins' elementary Series.) Enl. ed. London. 12mo. *Collins*. 1s. 6d.
- Part II. The Metals. Comp. by J. C. Thorpe. (Advanced Science Series.) New York. 12mo, illus. *Putnam*. \$1.50.
- System of volumetric Analysis. Emil Fiescher. Trans., with Notes and Additions, from 2d German Ed., by M. M. Pattison Muir. London. 8vo. *Macmillan & Co. (New York.)* 7s. 6d.
- Treatise on —. H. E. Roscoe and C. Schorlemmer. Vol. I. The non-metallic Elements. London. 8vo. illus. *Macmillan (New York.)* 21s.
- Civil Engineers, Minutes of Proceedings of the Institution of —, with other selected and abstracted Papers, ed. by James Forrest. Vol. XLIX. Sessions 1876-1877. Part 3. London. 8vo, illus. *Inst. Civil Eng.*
- , Proceedings of the Swedish Society of —. Vol. XLI. Part 2. Stockholm. 4to, illus. (Swedish.)
- Concrete: its Use in Building and the Construction of Walls, Floors, &c. Thomas Potter. London. 8vo, illus. *Spon.* (New York.) 4s.
- Comic Sections, the Book of —, treated geometrically, with an elementary Treatise on Analytical Geometry. F. Harrison. London. 8vo. *Stewart & Co.* 1s.
- Cotton Goods, Sizing of —, and the Causes and Prevention of Mildew. W. Thomson. Manchester. 8vo. *Palmer & Hooce*. 7s. 6d.
- Spinner, the practical —. M. Scott. 9th ed., rev., with add. Examples and Tables, adapting the Work to modern Practice. Manchester. 8vo. *Heywood*. 12s.

- Cyclopædia, general Index to the American —, Dr. Conant. New York. 8vo. *Appletons*. (Announcement.)
- Drawing Books, illustrated.—Mark M. Maycock. In 8 vols. Vols. V and VII. Buffalo. *M. Taylor*. (Announcement.)
- How to Draw a Straight Line, a Lecture on Linkages. A. B. Kempe. (Nature Series.) London. 8vo, illus. *Macmillan*. (New York.) 1s. 6d.
- Industrial.—D. H. Mahan. New ed., rev. and enl. by D. F. Thompson. New York. *Wiley & Sons*. \$3.50.
- Linear, Perspective and Model —, a School and Art Class Manual. Laurence Anderson. London. 4to, illus. *Macmillan*. (New York.) (Announcement.)
- Education, the Cyclopædia of —, by Henry Kiddle and Alexander J. Schem. New York. 8vo. *McGraw*.
- Encyclopædia Britannica, a Dictionary of Arts, Sciences and general Literature. 9th ed. (American Reprint.) Vols. V, VI. Philadelphia. 8vo, illus. *Stoddart*. \$5.00 per vol.
- Engineering Construction, a Treatise on —, embracing Discussions of the Principles involved and Descriptions of the Materials employed in Tunneling, Bridging, Canal and Road Building, etc. J. E. Shields. New York. 12mo, illus. *Van Nostrand*. \$1.50.
- Papers, Abstracts of —, in foreign Transactions and Periodicals, ed. by James Forrest. (Minutes of Proceedings. Institution of Civil Engineers. Vol. XLVIII.) London. 8vo. *Inst. Civil Eng.*
- Engineers' and Contractors' illustrated Book of Prices and Engineers' Directory for 1877-8. London. 4to. *Spon's* (New York). 7s. 6d.
- Printed Papers of the Essayons Club of the Corps of —, read during Winter of 1876-77. Nos. XI-XLIV. Willets Point. 4to.
- Proceedings of the Austrian Society of — and Architects. Vol. XXIX. Part 7. Vienna. 4to, illus. (German.)
- Proceedings of the Society of — and Architects of Hanover. Vol. XXIII; Part 3. Hanover. 4to, illus. (German.)
- Transactions of the North of England Institution of Mining and Mechanical —. Vol. XXVI. Part 4. Newcastle-on-Tyne. 8vo, illus.
- Ephemeris, the American — and nautical Almanac for Year 1880. Ed. by J. H. C. Coffin. Washington. 8vo. *Gov. Printing Office*.
- Fern World, (the). Francis G. Heath. London. 8vo, illus. *Low*. 12s. 6d.
- Ferns, British and foreign; the History, Organography, Classification, and Enumeration of the Species of Garden Ferns, with a Treatise on their Cultivation, etc. John Smith. Fol. ed. (London Reprint.) New York. 8vo, illus. *Putnam's*. (Announcement.) \$3.50.
- Floods in the River Thames, Prevention of —. (Parliamentary Report.) London. 8vo. 8s.
- Gas Companies, (Metropolis). Accounts for 1876. (Parliamentary Report.) London. 8vo. 4d.
- Geography, elementary Lessons in physical — Archibald Geikie. London. 16mo, illus. *Macmillan*. (New York.) \$1.75.
- Geology, Class Book in —. J. S. Newberry. New York. *Appletons*. (Announcement.)
- Elements of —. Jos. Le Conte. New York. *Appletons*. (Announcement.)
- Geometry, Elements of —. George A. Wentworth. Boston. *Ginn & Heath*. (Announcement.)
- Gunnery, Manual of —, for Her Majesty's Fleet, with Alterations to January 1st, 1877. London. 16mo. (British Gov. Publication.) 2s.
- Health, the Public Health Act, 1875 (38 & 39 Vict., Cap. 55), and the Rivers Pollution Prevention Act, 1876 (39 & 40 Vict., Cap. 75). Text of the Queen's Printers' ed., preceded by a complete Index. F. Stratton. London. 8vo. *Knight*. 3s.
- Heat, an elementary Treatise on —, in Relation to Steam and the Steam-Engine. G. Shann. London. 8vo, illus. *Macmillan*. (New York.) (Announcement.)
- Heliotype Process, (the). E. Edwards. Boston. 4to, illus. *Osgood*.
- Indicator Diagram practically Considered. N. P. Burgh. 5th ed. London. 8vo. *Spon's*. (New York.) 6s. 6d.
- Industrial Art: a monthly Review of technical and scientific Education at Home and Abroad. No. 1. London. 4to. *Hardwicke*. 1s.
- Infantry, a Key to the Field Exercise and Evolutions of —, as revised in 1877. With Plates of Attack Formations. W. D. Malton. London. 16mo. *Cloves*. 1s.
- Insects, our common —. A. S. Packard. New ed. Boston. Illus. *Eates & Lauriat*. (Announcement.) \$1.50.
- Invertebrates, Huxley's Manual of —. New York. *Appletons*. (Announcement.)
- Iron Smelter's Pocket Analysis Book. Thomas Whitwell. London. 16mo. *Trubner*. 5s.
- Labor and Capital, the Question of —. John B. Jervis. New York. 12mo. *Putnam's*. \$1.25.
- Latitude, Tables for finding — of a Place by Altitudes of Polaris. Supplement to American Ephemeris and Nautical Almanac for year 1880. Ed. by J. H. C. Coffin. Washington. 8vo. *Gov. Printing Office*.
- Least Squares, an elementary Discussion of the Principles of —, Reprinted from Journal of the Franklin Institute. Mansfield Merriman. Philadelphia. 8vo. *Franklin Institute*.
- , Elements of the Method of —. Mansfield Merriman. London. 12mo. *Macmillan* (New York). \$2.50.
- Light, a Series of simple, entertaining and inexpensive Experiments in the Phenomena of Light. (Vol. I. experimental Science Series for Beginners.) Ed. by Alfred M. Mayer as't by Charles Bernard. New York. 12mo, illus. *Appletons*. \$1.00.
- Locomotive Engine Driving from the Foot Plate, a practical Manual for Engineers in Charge of Locomotive Engines. Michael Reynolds. London. 12mo, illus. *Lockwood, Crosby & Co.* 4s. 6d.
- Mathematics, the American Journal of pure and applied —. Ed. by J. J. Sylvester and W. E. Story. Published under Auspices of the John Hopkins University. Quarterly. Baltimore. 4to. (Announcement.) Per year. \$5.00.
- Measuring Machine, the Whitworth—including Descriptions of the Surface Plates, Gauges, and other measuring Instruments made by Joseph Whitworth. T. M. Good-eve and C. P. B. Shelly. London. 4to, illus. *Longmans*. (Van Nostrand, New York.) \$10.00.
- Mechanics, adapted for the extra Subject of the New Code. H. Evers. London. 12mo. *Collins*. 6d.

- Book of —. Part I: Statics. R. O. Thorpe. London. 12mo. *Stewart*. 1s.
- , elementary Principles of—. Devolson Wood. New York. *Wiley & Sons*. (Announcement.)
- Microscope, practical Hints on the Selection and Use of —. 2d ed., ed. John Phil. New York. 12mo, illus. *Ind. Publishing Co.* \$0.75.
- Mississippi River, Report on the Physics and Hydraulics of —, upon the Protection of the alluvial Region against Overflow, and the Deepening of the Mouths. Reprinted with Additions. No. 13. Professional Papers Corps of Engineers, U. S. A. A. A. Humphreys and H. L. Abbot. Washington. 4to, illus. *Gov. Printing Office*.
- , Seventh Report upon the Improvement of the South Pass of the Mississippi River, showing Conditions of Works, July 24, 1877. M. R. Brown. Washington. 8vo, illus. *Gov. Printing Office*.
- Money and legal Tender in the United States. Henry R. Linderman. New York. 12mo. *Putnam's*. (Announcement.)
- Naturalists' Guide in Collecting and Preserving Objects of natural History, with a complete Catalogue of the Birds of eastern Massachusetts. C. J. Maynard; illus. by E. L. Weeks. Rev. ed. Salem. 12mo. *Naturalists' Agency*. \$2.00.
- Natural History and Antiquities of Selborne. Gilbert White. New ab'd ed. London. 12mo, illus. *Routledge*. (New York. Announcement.) \$1.75.
- Philosophy, Elements of—, A. E. Dolebear. Boston. *Ginn & Heath*. (Announcement.)
- Nautical Terms and Phrases, for naval and mercantile Officers, Engineers, Shipowners, Merchants, Shipbrokers, Travelers, &c. E. Ponnain, London. *Simpkin*. (Van Nostrand, New York.) 8vo. \$2.00.
- Navigation and Shipping. Statement, 1876. (Parliamentary Report.) London. 8vo. 3s. 6d.
- Optics, the undulatory Theory of—, for Use of Students in the University. G. B. Airy. New ed. London. 8vo. *Macmillan*. (New York.) 6s. 6d.
- Painting, a Treatise on—, Leonardo da Vinci. From the Italian by John Francis Rigaud; with Life of Leonardo and Account of his Works by John W. Brown. New ed. rev. London. 12mo. \$2.00.
- Parks and Gardens of London, the Royal—their History and Mode of Embellishment, with Hints on the Propagation and Culture of the Plants employed, the artistic Arrangement of Colors, &c. Nathan Cole. London. 8vo, illus. *Journal of Horticulture Office*. 5s.
- Philosophy, modern Philosophy from Descartes to Schopenhauer and Hartmann. Francis Bowen. New York. 8vo. *Scribner, Welford & Armstrong*. \$3.00.
- recent British—; a review with Criticisms. D. Masson. 3d ed., with add. Chapter. London. 8vo. *Macmillan*. (New York.) 6s.
- Polaris, Navigation of the North Sea Expedition, U. S. Ship Polaris. Ed. by C. H. Davis. Washington. 8vo, illus. *Gov. Printing Office*. New York. *Appletons*.
- Pottery and Porcelain. Charles W. Elliott. New York. *Appletons*. (Announcement.)
- Printing, the Invention of—, a Collection of Facts and Opinions descriptive of early Prints and Playing Cards, the Block Books of the 15th Century, the Legend of Lourens, Janzeoon Coster of Haarlem, and of the Work of John Gutenberg and his Associates. Theo. L. De Vinne. New York. 8vo, illus. *Francis Hart & Co.* \$10.00.
- Pumping Engine, the Whiston — St. Helens, Lancashire. Thomas S. Stooke. [Excerpt Minutes of Proceedings, Institution of Civil Engineers.] London. 8vo, illus. *Inst. Civil Eng.*
- Punctuation, a Handbook of—, containing the more important Rules, and an Exposition of the Principles upon which they depend. Joseph A. Turner. New rev. ed. Philadelphia. 16mo. *Lippincott*. \$0.75.
- Pyramid, Philittis, or Solution of the Mystery which for 4000 Years has shrouded the Great Pyramid in Egypt. Charles Casey. 4th ed. Dublin. 8vo. *Carson*. 2s.
- Railroad. Report of Milton Courtwright, Chief Engineer of the New York Elevated—, June 1, 1877. New York. 8vo.
- Railway. Report of Surveys and preliminary Operations on the Canadian Pacific—up to January, 1877. Sandford Fleming, Engineer in Chief. Ottawa. 8vo, illus.
- The Midland—its Rise and Progress. Frederick S. Williams. 3d ed. London. 8vo. *Bemrose*. 21s.
- Railways, Permanent Way, rolling Stock, and technical Working of—, followed by an Appendix on Works of Art. Charles Couche. Trans. from the French by James N. Shoolbred. 4 vols. London. *Dulau & Co.* Vol. I. 4to. text, atlas of plates. 40s.
- Victorian—, (Parliamentary Report.) London. 8vo. 8d.
- Rigger's Guide, and Seaman's Instructions for Rigging Ships in Rope or Wire. C. Bushell. 6th ed. London. 12mo. *Simpkin*. 3s.
- Sanitary Condition of City and Country Houses. George E. Waring, Jr. New York. 18mo, illus. (Van Nostrand's Science Series.) *Van Nostrand*. \$0.50.
- Science, Manchester—Lectures for the People. 8th Series, 1876-7. Profs. Roscoe, Williamson and Lockyer. London. 12mo. *Macmillan*. (New York.) \$0.75.
- Principles of—, W. S. Jevons. London. 12mo. *Macmillan*. (New York.)
- Warfare of—, with prefatory Note by Prof. Tyndall. Andrew D. White. 2d ed. London. 8vo. *Henry S. King*. 3s. 6d.
- Sciences, a Vocabulary of philosophical—, including the Vocabulary of Philosophy, mental, moral and metaphysical, by William Fleming, from 2d and 3d ed., ed. by Henry Calderwood. Charles P. Krauth. New York. *Sheldon & Co.* \$3.50.
- Sewage, Purification of Water-carried—. Data for the Guidance of Corporations, local Boards of Health, and sanitary Authorities. Henry Robinson and John C. Melliss. New York. 8vo. *Putnam's*. (Announcement.)
- Shipping Telegram Code. London. *Norie & Wilson*. 25s.
- Star Atlas for the Library, School and Observatory, (new). Richard A. Proctor. New York. 8vo. *Putnam's*. \$2.50.
- Gazing, past and present. Prof. Lockyer. London. *Macmillan*. (Announcement.)
- Half Hours with—. Richard A. Proctor, 8th ed. London. 4to, illus. *Hardwicke & Bogue*. 5s.
- Statics, Treatise on—, containing some of the fundamental Propositions in Electro-

- Statics. G. M. Minchin. London. 8vo. *Longmans*. (*Van Nostrand*. New York.) \$5.25.
- Steam-Engine, the Theory and Action of —, for practical Men. W. H. Northcott. London. 8vo, illus. *Cassell, Pether, & Galpin*. (New York.) \$3.50.
- Surveyors, general Instructions for hydrographic —. (British Gov. Publications.) London. 8vo. 1s.
- Taught for the Use of Engineers and Architects. C. J. Bellamy. 2d ed. London. 8vo. *Stanford*. 15s.
- Thames, the River —. John B. Redman. With Abstract of Discussion. (Excerpt Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. Civil Eng.*
- Tunnel Construction and the Sydenham Tunnel. London. Chatham & Dover Railway. A. E. Baldwin. (Excerpt Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. Civil Eng.*
- Water Purification, Hand Book of — —, for the Guidance of Corporations, local Boards of Health, and sanitary Authorities. Henry Robinson and John C. Melliss. London. 8vo, illus. (*Van Nostrand*. New York.) \$7.50.
- Supply. Report on the various Projects for the — — of San Francisco, made to Board of Water Commissioners by George H. Mendall, Engineer. San Francisco. 8vo, map.
- Works. Annual Report of Board of Water Commissioners of Toronto, and Report of Chief and Consulting Engineer. Toronto. 8vo.
- Wealth. Economics, or the Science of Wealth, a Treatise on Political Economy, for use of Schools, Colleges and the general Reader. J. M. Sturtevant. New York. 8vo. *Putnam*. \$1.75.
- Enquiry into the Nature and Causes of the Wealth of Nations. Adam Smith. New ed. New York. 8vo. *Putnam*. (Announcement.) \$2.00.
- How shall the Nation regain Prosperity; a Discussion of the Elements and Amount of our national Wealth, and the Causes and Remedies for the present industrial, commercial, and financial Depression. David A. Wells. New York. 8vo. *Putnam*. (Announcement.)
- Weather Warnings for Watchers, with concise Tables for calculating Heights. London. 12mo. *Houlston*. 1s.
- Works. Metropolitan Board of —. (Parliamentary Report.) 1876. London. 8vo, 1s. 3d.
- Yachtman's Handy Book for Sea Use. W. H. Rosser. London. 8vo. (*Van Nostrand*. New York.) \$1.75.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From American Institute of Architects, New York :
- Proceedings of the Ninth Annual Convention of the Institute, held in Philadelphia, Oct. 11 and 12, 1876. New York.
- From American News Co., New York :
- The American Bookseller, from July, 1877. A semi-monthly. New York.
- From American Vulcanizing Wood and Lumber Co., New York.
- Art of Seasoning and Preserving Wood and Lumber by Vulcanizing. New York, 1877.
- From Austrian Society of Engineers and Architects, Vienna :
- Journal of the Society. Vol. XXIX. Parts VII and VIII. Vienna, 1877.
- From E. P. Boon, New York :
- Catalogue of scientific Pamphlets, for sale by E. P. Boon, Agent. New York, 1877.
- From J. C. Campbell, New York :
- Regulations establishing a Scale of Water Rents for City of New York. May 1, 1876.
- From O. Chanute, New York :
- Portion of a Spruce Pile driven in 1870 at Weehawken, in North River Dock, eaten off by *Teredo Navalis* at surface of the Mud, by December, 1876.
- From A. J. Chapke, St. Louis, Mo. :
- Report of Board of Water Commissioners of City of St. Louis, with Chief Engineer's Reports for Years 1865 to 1876. St. Louis.
- From Claxton, Remsen & Haffelfinger, Philadelphia :
- Treatise on the Use of Belting for the Transmission of Power. J. H. Cooper, Philadelphia, 1877.
- From J. H. C. Coffin, Washington :
- American Ephemeris and Nautical Almanac for 1880. Washington, 1877.
- Tables for Finding the Latitude of a Place by Altitudes of Polaris. Washington, 1877.
- From F. Collingwood, New York :
- Specifications for Granite Face, Arch and other Stone, required for the New York and Brooklyn Approaches to East River Bridge.
- From the Committee of Publication, Vienna :
- Journal of Artillery and Military Engineering, from January, 1877; a Monthly. (German.)
- From J. J. R. Croes, New York :
- City of New York. Department of Public Parks. Proposals for constructing Sewers in Brook Avenue, in Mott Haven and in 143d Street. Separate numbers. New York, 1877.
- From D. Draper, New York :
- Report of the Director of the New York Meteorological Observatory. Department of Public Parks, for Year 1876. D. Draper.
- From E. Edwards, Boston :
- The Heliotype Process. Boston, 1877.
- From C. E. Emery, New York :
- Report of the trial of Steam Machinery of U. S. Revenue Steamer "Gallatin" in Dec. and Jan'y, 1874-5. Washington. (Copies for distribution.)
- From Essays Club of the Corps of Engineers, Willet's Point, N. Y. :
- Printed Papers of the Club, read during the Winter of 1876-7, being: XL—The Shock at Hallet's Point; Gen. Abbot. XLI—Station Errors near 49th Parallel; Lieut. Greene.

- XLII—Two Levels in Zenith Telescope Method :** Lieut. Bailey. **XLIII—Notes on Magnetic Determinations, and, XLIV—Notes on Distribution of Magnetism ;** Capt. Raymond.
- From J. T. Fanning, Manchester, N.H.: **Treatise on Water Supply Engineering, relating to Hydrology, Hydro Dynamics, and Construction of Water Works in North America.** J. T. Fanning. New York, 1877.
- From S. Fleming, Ottawa, Can.: **Report of Surveys and preliminary Operations on Canadian Pacific Railway, to January 1st** S. Fleming, Engineer in Chief. Ottawa, 1877.
- From D. M. Greene—another copy from J. D. Van Buren, Jr.—Albany, N. Y. : **Annual Report of State Engineer and Surveyor, on Canals of the State.** February 15, 1877. Albany.
- From P. C. Haines, Engineer Secretary, Light House Board, Washington : **List of Beacons, Buoys, Stakes, Spludles, and other Day and Night Marks, in 1st, 3d, 4th, 5th, 6th, 8th, 10th, 11th, 12th, and 13th Light House Districts.** Washington.
- From Hanover Society of Engineers and Architects. Hanover : **Catalogue of Royal Polytechnic School of Hanover for 1877-8.** (German.) **Journal of the Society.** Vol. XXIII. Part 3. 1877. (German.)
- From Gen. A. A. Humphreys, Chief of Engineers, U. S. A. Washington : **Report upon Physics and Hydraulics of Mississippi River, on Protection of the alluvial Region against Overflow, and on Deepening of the Mouths.** Reprinted, with Additions. A. A. Humphreys and H. L. Abbot. Washington, 1876.
- Seventh Report upon Improvements of South Pass of the Mississippi River, showing Condition of Works.** July 24th, 1877. M. R. Brown. (Copies for distribution.)
- From Institution of Civil Engineers, London : **Excerpts from Minutes of Proceedings, Sessions 1876-7, as follows :**
Abstracts of Papers in foreign Transactions and Periodicals.
Economical Method of manufacturing Charcoal for Gunpowder. George Haycraft. With Abstract of Discussion.
History of the modern Development of Water-Pressure Machinery. William G. Armstrong. With Abstract of Discussion.
Street Tramways. R. Souttar. With Abstract of Discussion.
The River Thames. J. B. Redman. With Abstract of Discussion.
Tunnel Construction, and the Sydenham Tunnel. London. Chatham & Dover Railway. A. E. Baldwin.
Whiston Pumping Engine. St. Helen's, Lancashire. F. S. Storke.
Minutes of Proceedings, with other selected and abstracted Papers. Sessions 1876-7. Part 3, Vol. XLIX.
- From Iron and Steel Institute, London : **Journal of the Institute.** 1877. London.
- From J. B. Jervis, Rome, N. Y. : **The Question of Labor and Capital.** J. B. Jervis. New York, 1877.
- From C. Latimer, Cleveland, O. : **Atlantic & Great Western Railway. Comparative Statement of Expenses in Engineering Department.** May and June, 1876 and 1877. 2 sheets.
- From Louisiana Cotton Tie Co., New Orleans : **Treatise on the Rationale of compressing Cotton.** S. H. Gilman. New Orleans.
- From G. H. Mendell, San Francisco: **Report on the various Projects for Water Supply of San Francisco.** G. H. Mendell, Chief Engineer. 1877.
- From M. Merriman, New Haven, Conn: **Elementary Discussion of the Principle of Least Squares.** M. Merriman. Philadelphia, 1877.
- From R. J. Morrison, New York : **The City Record.** Vol. V, Part 2. New York, 1877.
- From New York Elevated R. R. Co., New York : **Rapid Transit Meeting at Chickering Hall.** New York, 1877.
Rapid Transit Meetings at Lion Park, Harlem Association, Chickering, and Parepa Halls, and Trinity Building. New York, 1877.
Reports of the President and of the Chief Engineer, June, 1877. New York. 2 numbers.
- From North of England Institution of Mining and Mechanical Engineers. Newcastle-on-Tyne, England : **Charter and By-Laws of the Institution. General Index to Transactions, Vol. I—XXVI, 1852-76.**
Transactions, April, May and June, 1877. Vol. XXVI, Part 4.
- From J. E. Nourse, Washington : **Narrative of the North Sea Polar Expedition, U. S. Ship Polariss.** Ed. by Rear Admiral C. H. Davis, U.S. Navy. Washington, 1876.
- From P. A. Peterson, Toronto, Can.: **Toronto Water Works. Annual Reports of the Board of Water Commissioners and the Chief Engineer, for 1877.** Toronto.
- From G. A. Putnam's Sons, New York : **Putnam's Library Companion a quarterly Summary of Publications.** F. A. Perkins. New York, 1877.
- From B. Quaritch, London : **Catalogue of Periodicals, Transactions of learned Societies, &c., from private Presses and historical Collections.** September, 1877. London.
- From F. Rinecker, Wuerzburg, Germany : **Mt. Riga Railway. Photographs of a Locomotive and a Train on a Viaduct.**
Raising a Roof. F. Rinecker. (German. Copies for distribution.)
- From E. G. Schweig, New York : **On Uses of Galvanic and Faradic Baths.** From Medical Record. New York, 1874.
- From Henry Sharp, London: **Correspondence on Application of Steel Plates for Manufacture of Steam Boilers, accompanying Results of Experiments on riveted Joints and Steel Plates.** London.
Discussion of Treatment of Steel Plates. London, 1868.
The Treatment of Steel Plates. Henry Sharp. London, 1868.
Results of Experiments on riveted Joints and Steel Plates. D. Kirkaldy, London, 1872.

From T. G. Smith, Buffalo, N. Y.:
 Plimpton Fire Proof Elevator—a Lithograph.
 Tolls and Transportation; a free Canal es-
 sential to the State's Prosperity; the Water
 Route superior to Railways. A. Richmond,
 Buffalo, 1877.

From Society of Civil Engineers, Paris :
 Memoirs and Proceedings of the Society.
 May and June, 1877. Paris (French).

From Swedish Society of Civil En-
 gineers, Stockholm, Sweden :
 Proceedings of the Society. Vol. XLI., Part
 1. Stockholm, 1877 (Swedish).

From W. Steinway, New York :
 Report of Board of consulting Engineers upon
 Plan for New York and Long Island Bridge.
 New York, 1877. Several copies.

From U. S. Naval Observatory, Wash-
 ington :
 Letter to Secretary of Navy, announcing Dis-
 covery of Satellites of Mars. Washington,
 1877.

From D. Van Nostrand, New York :
 New Constructions in graphical Statics. H.
 T. Eddy. New York, 1877.

From A. B. Venable, San Francisco :
 An Act relative to Commissioners of Trans-
 portation of State of California, their Powers
 and Duties, April 3d, 1876. Sacramento.
 6 copies.

Blank Form of annual Report of Railroad
 Companies to Board of Transportation Com-
 missioners, for Year ending June 30, 1877.
 Sacramento. 6 copies.

From J. Wiley & Sons, New York :
 Elementary Course of Civil Engineering for
 Use of Cadets of U. S. Military Academy.
 J. B. Wheeler. New York, 1877.

From D. Williams, N. Y. :
 The Metallurgical Review : a Monthly. Vol.
 I, No. 1. September, 1877. New York.

From miscellaneous Sources :
 Annals of the Ministry of Public Works.
 Mexico. January, 1877 (Spanish). 2 copies.
 Catalogue of technical Literature. Ed. by
 Bruno Kerl. New Series. 1854-1875. 2
 vols. Leipzig. (German.)
 — of the University of Cincinnati for
 Year 1877-8.

Report of Department of Public Works, for
 Quarter ending June 30, 1877. New York..

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY.—An adjourned
regular and stated meeting, for transaction of
 business and consideration of professional
 topics, will be held Thursday, October 18th,
 at eight o'clock P. M.

The Twenty-fifth Annual Meeting of the
 Society will be held Wednesday, November
 7th, at ten o'clock, A. M. The Annual Report
 of the Board of Direction, on the affairs of
 the Society, including the Report of the Treas-
 urer, will be presented; officers for the en-
 suing year elected; the Norman Medal award-
 ed; time and place of the Tenth Annual Con-
 vention fixed; ballots for members can-
 vassed; action taken upon pending amend-
 ments to the Constitution,* relating to
 the proposal, election, classification, remis-
 sion of dues, prohibition from voting and
 expulsion of members, and to the By-Laws
 relating to adoption of future amendments;
 also upon resolution† defining duties of the
 Secretary; and other important business
 done.

Reports from Committees, as follows, will
 be called for :

Centennial Commission of the Society,

THEODORE G. ELLIS, *Chairman*.
 Gauging of Streams, and

Nomenclature and Classification of Masonry,
 J. JAMES R. CROES, *Chairman*.

Metric System of Weights and Measures.

CLEMENS HERSCHEL, *Chairman*.

* For text of these, see pages 50, 51, and 86.
 † For text of this, see page 86.

Permanent Quarters for the Society,

JOHN BOGART, *Chairman*.
 Resistance of Railway Trains, and
 Uniform Accounts and Returns of Railroad
 Companies.....WILLIAM P. SHINN, *Chair-
 man*.

Tests of American Iron and Steel,

W. SOOY SMITH, *Chairman*.

An informal dinner for members of the
 Society and invited guests will be had in the
 evening.

A circular has been sent to members, em-
 bodying this announcement, asking each to
 say whether he will be present at the Annual
 Meeting, and if he will join in the dinner
 proposed; also to state his preference as to
 time and place of the next the Tenth—An-
 nual Convention. Members are requested to
 promptly forward replies to the Secretary.

PAPERS HAVE BEEN PRESENTED since last
 announcement, as follows:

Levees; a Discussion.

J. FOSTER FLAGG, Aug. 25, 1877.

Connected Arc Marine Boilers; a Discussion.

J. FOSTER FLAGG, Aug. 31, 1877.

PAPERS ON ENGINEERING SUBJECTS, giving
 results of practice, or in discussion of per-
 tinent theoretical questions, are desired from
 members of the Society; their comments
 (whether or not present at meetings of the
 Society) upon papers published in Transac-
 tions are solicited, and they are urged to con-
 tribute from note-books and other similar

records whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, vol. 1.

METRIC SYSTEM OF WEIGHTS AND MEASURES.—Attention is called to the following resolution, adopted at the Ninth Annual Convention:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, that members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election.
ATKINSON, JAMES B. Sec. and Treas. St. Bernard Coal Co., Earlington, Ky.	Sept. 5, 1877.
BRUSH, CHARLES B. (Associate to Member), Spielman & Brush, Hoboken, N. J.	" "
BULLOCK, WILLIAM D, [J.] Ass't Engineer Water Works, Provi- dence, R. I.	" "
GOLAY, PHILIP Ch. Engineer Miami Valley R'y, Cin- cinnati, Ohio	" "
HAYWARD, JAMES A. Drawer 432, New Orleans, La.	" "
HYDE, WILLIAM B. Oakland, Cal.	July 12, "
PARKHURST, H. W. Louisiana, Mo.	Sept. 5, "
SPIELMAN, ARTHUR. (Associate to Member), Spielman & Brush, Hoboken, N. J.	" "

CHANGES AND CORRECTIONS.

BISSELL, HEZEKIAH. (Care Am. Soc. Civil Eng's), New York.
BUCK, LEFFERTS L. (Care W. G. Swan), Suspension Bridge, N. Y.
EMERSON, GEORGE D. 31 Washington place, New York.
GOODWIN, JOHN M. Eng. Sharpville R. R., Sharpville, Mercer Co., Pa.
HOUSTON, JOHN. Spring Valley, Rockland Co., N. Y.
KNIHT, WILLIAM B. Fordham Branch, Post Office New York.
McGEE, JOHN. (Care O. C. James), Rio Janciro, Brazil.
MERIWETHER, NILES. Huntsville, Ala.
MOORE, ROBERT. Sewer Commissioner, St. Louis, Mo.
SEIDGWICK, THOMAS S. Chicago, Ill.

RESIGNATIONS.

CABOT, GEORGE D. Lawrence, Mass.	Oct. 4, 1877.
MITANDER, NILS. New York.	" 3, "

DEATHS.

ENSIGN, E. W. [F.] (Late of) Buffalo, N. Y.	Oct. 1, 1877.
TYSON, HENRY " Baltimore, Md.	Sept. 2, "

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. October, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

OCTOBER 18, 1877.—An adjourned regular and stated meeting was held at 8 o'clock P. M.

The appointment of the following committees was announced.

To present memoirs of the life and professional services of deceased members :

Of Robert L. Cooke, deceased, J. J. R. Croes and C. R. Schott ; of Charles S. Emack, deceased, Martin Coryell ; of Louis Nickerson, deceased, Edward P. North ; of William B. Ogden, deceased, E. S. Cheshbrough and Geo. S. Greene ; of Henry Tyson, deceased, M. N. Forney and William R. Hutton ; the Secretary being also a member of each of these committees.

Committee to provide a dinner on the evening of the annual meeting, John Avery and the President.

The following were offered and seconded :—

Amendment to the By-Laws, proposed by F. Collingwood :—

SECTION 20 to read :—The Treasurer shall deposit the moneys and invest the funds of the Society, in its name, by and with the advice of the Board of Direction ; he shall draw all checks, which shall be signed by him and the President or Chairman of the Committee on Finance and countersigned by the Secretary.

Substitute proposed by William J. McAlpine :—

SECTION 20 to read :—The Treasurer, before he shall enter upon his duties, shall give a bond for the faithful discharge thereof, to the amount of \$5,000, with sureties therefor who shall be approved by the Com-

mittee on Finance. All moneys which he may receive shall be immediately deposited to the credit of the Society, in such Bank as the Committee on Finance shall direct.

None of the moneys, securities, or other property of the Society shall be paid out or incumbered, except for the payments of bills and accounts which have been duly examined and approved by the Committee on Finance, and no moneys shall be withdrawn except for such duly approved bills and accounts drawn by the Secretary and approved by the Committee on Finance in favor of the person to whom such moneys are due.

Amendment to the By-Laws proposed by Geo. S. Greene :—

SECTION ... (A new Section).—In all cases where the By-Laws, or resolutions of the Society or of the Board of Direction, require specific duties to be performed by the President, the senior Resident Vice-President present shall perform such duties in the absence of the President, on receiving notice from the President to perform such duties.

Additional to resolution offered, October 3d, proposed by G. Leverich :—

The Secretary shall devote his whole time and attention to the service of the Society ; he shall receive therefor a salary of \$2,400 per year, and his assistants shall be paid by the Society, at rates and in gross amount as fixed and appropriated by the Board of Direction.

Substitute for same proposed by Wm. J. McAlpine :—

The Secretary shall be required to devote his whole time and attention to the duties of his office and shall not undertake any other professional duty ; failing in this, he shall vacate his office of Secretary. His salary shall be \$. . . per annum, and under no circumstances shall he receive other money except by a vote of the Society. He may nominate an assistant, to whom may be paid \$. . . per year ; which nomination must be first submitted to the Board of Direction, and if approved, to a vote of the Society.

Substitute for same proposed by O. Chanute :

The Secretary shall devote his whole time and attention to the service of the Society, and shall not undertake any other professional duty ; he shall therefor receive a salary of \$2,400 per year, out of which he shall pay such assistants as he may employ.

Action on these was deferred until the annual meeting.

The following preamble and resolution were offered by G. Leverich, for consideration at the annual meeting, and if then so ordered, to be submitted in December to the Members, Associates and Juniors of the Society for approval by ballot : each voter to affix his signature, and the canvass and a report to be made at the regular meeting in February :—

Whereas, A Civil Engineer, in the practice of his profession, is sometimes restrained or overruled by his employers, in matters involving serious risk to property and life which he *only*, as the engineer should

determine ; whence he must either discharge his duties in a manner contrary to his best judgment or resign his position ;—

Resolved, That in the opinion of the members of the American Society of Civil Engineers, who vote affirmatively upon this resolution, it is unprofessional for a civil engineer to continue the discharge of his duties when so restrained or overruled ; or to accept an engagement which it is generally known has been vacated because of such interference by employers, until the judgment of his predecessor has been formally disapproved by other disinterested civil engineers, competent to decide and familiar with the facts of the case.

The following was offered as a substitute for the same by William J. McAlpine :

Whereas, A Civil Engineer, in the practice of his profession, is sometimes restrained or overruled by his employers in matters involving serious risk to property and life ;—

Resolved, If such engineer shall see fit, he may ask for the appointment of a committee of the Members of the Society to examine the questions at issue, and if such committee shall advise in his favor, then and after proper representations to his employers, it is the opinion of those who vote in the affirmative, that it is his duty to resign his position. It is also the opinion of those who so vote, that it would be unprofessional for any member of the Society to accept the place so vacated, unless such member disagrees in opinion upon some material point involved in the controversy.

The Society then adjourned.

OF THE BOARD OF DIRECTION.

OCTOBER 4TH, 1877.—The Board met and adjourned without action.

OCTOBER 9TH, 1877.—The Board met and received report in reference to unpaid dues. A report was also received in reference to arranging the names of members in order of their seniority.

OCTOBER 11TH, 1877.—The Board met, received report of the Committee on Nominations for Officers of the Society, and directed the issue of ballots in accordance with the By-Laws.

NOVEMBER 1ST, 1877.—The Board met and considered draft of Annual Report. The following regulations governing the ballot for officers at the annual meeting were adopted :

It shall be the duty of the Secretary to prepare before the annual meeting an alphabetical list of the members of the Society who are entitled to vote for officers. Three tellers shall be appointed by the President at the annual meeting, who shall count the number of ballots

received by mail, examine the endorsements upon the ballots, make a mark opposite the name of each voter on the list, and remove the outer envelope. The President shall then request such members present as have not voted to deposit their ballots, and the tellers shall mark on the list the name of each person so voting. When all have had an opportunity to vote, the tellers shall proceed to open and count the ballots, and shall declare the result to the President, who shall announce it to the meeting. In case a second ballot shall be found necessary, the names of those voting shall be marked as before. The names of the members voting on the first ballot shall be published in the November issue of the Proceedings of the Society.

It shall be the duty of the Secretary to keep a book containing a list of the voting members of the Society, with columns ruled in such a manner as to enable the name of each voter on every letter ballot to be noted.

NOVEMBER 5TH, 1877.—The Board met, considered and perfected the draft of its Annual Report.

NOVEMBER 7TH, 1877.—The Board met and received a statement from the Centennial Commission of the Society in reference to memoirs upon special engineering topics prepared under its auspices. It was resolved that these memoirs be referred to the Committee on Library.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Architecture, a Handbook of Architectural Styles.** Trans. from the German of A. Rosengarten by W. Collett Sanders. New ed. London. Crown 8vo, illus. *Chatto & Windus*. 7s. 6d.
- Astronomy.** By J. Rambosson, Laureate of the Institute of France. Trans. by C. B. Pitman. New ed. London. Crown 8vo. *Chatto & Windus*. 7s. 6d.
- *Traité d'Astronomie et de Meteorologie appliquées à la Navigation*, Tome Premier, *Astronomie*. Par G. Chabirand. 8vo, paper. Paris, 1877. *Van Nostrand*. \$4.00.
- By R. S. Ball, Royal Astronomer of Ireland. London Science Class Books. London. 8vo, illus. *Longmans*. (Announcement.) 1s. 6d.
- Bricklaying. The rudiments of practical —.** Adam Hammond. 2d ed. Weales Series. London. *Lockwood, Crosby & Co.* 1s. 6d.
- Bricks and Tiles. Rudimentary Treatise on the manufacture of —.** Edward Dobson. With Additions by C. Tomlinson. New ed. Weales Series. London. Illus. *Lockwood, Crosby & Co.* 3s.
- Chemistry, A primer of —, including Analysis.** Arthur Vacher. Philadelphia. 16mo. *Lindsay & Blakiston*. (Announcement.) \$0.50.
- *A Manual of Inorganic*. Vol. 1. *The Non-Metals*. New ed. With Copious Index and Examination Questions and Exercises. (Collins' Advanced Science Series.) T. E. Thorpe. London. 12mo. *Collins*. 3s.
- *Miller's Elements of —, Part 1. Chemical Physics*. 6th ed., rev., with Additions by H. McLeod, Professor of Experimental Science, Royal Engineering College. London. 8vo, illus. *Longmans*. 16s.
- Conic Sections. The method of Projections.** S. B. Kincaid. London. 8vo. *Stanford*. 2s. 6d.
- Cornwall. Observations on the rich parts of the lodes of —. Their Form and their Relations with the Directions of the Stratigraphic Systems.** L. Moissenet. Trans. by J. H. Collins. London. *Simpkins*. 7s. 6d.
- Diatoms. Practical directions for collecting, preparing and mounting —.** A. M. Edwards. New York. 12mo. *Indust. Pub. Co.* \$0.75.

- Drainage, the — of Lake Fucino, by Prince A. Torleita. Historical and technical account, by A. Brisse and L. de Rotrou. Trans. by V. de Tivoli. London. 4to. and folio Atlas, illus. *Dulau & Co.* £2.10s.
- Engineering, Dictionary of —. A Supplement to Spens ——. In about 36 numbers. New York. *Spens*. (Announcement.)
- Engineers. The Young —. What They Did and How They Did It. London. 16mo, illus. *Trübner & Co.* (Announcement.)
- Engines and Boilers. Pocket book of practical rules for the proportions of Modern — for land or marine purposes. 6th ed. London. 32mo. *Spens*. 4s. 6d.
- Encyclopædia, Chambers' New ed. 10 Vols. London and Edinburgh. *Chambers*. 8vo. £4.15s.
- Exact Sciences. The First Principles of the ——. Explained to the Non-Mathematical. W. Kingdon Clifford. London. *C. K. Paul & Co.* (Announcement.)
- Gas Consumer's Handbook. By W. Richards. London. *Spens*. (Announcement.)
- Geology of New Hampshire. By Prof. C. H. Hitchcock. Vol. 3 and Atlas. Concord, N. H. *E. C. Eastman* (Announcement.)
- , The Physical Geology and Geography of Great Britain. By Prof. A. C. Ramsay, Director General of the Geological Surveys of the United Kingdom. 5th ed., enl. London. Post 8vo., with Geological Map printed in Colors, and numerous Illustrations. *Stanford*. (Announcement.)
- , The Physical Geology and Geography of Ireland. By Edward Hall, Director of the Geological Survey of Ireland; Author of "The Coal Field of Great Britain." London. Post 8vo, with Maps and Illustrations. *Stanford*. (Announcement.)
- Geometry. The — of Compasses: or, Problems resolved by the mere Description of Circles, and the use of Colored Diagrams and Symbols. Oliver Byrne. London. 8vo. *Lockwood*. 3s. 6d.
- , descriptive. Elements of —, shadows and perspective. S. Edward Warren. New York. Small 8vo. Plates. *Wiley & Sons*. \$3.50.
- Health, Public. Reports and papers presented at the Meetings of the Amer. Public Health Assoc., 1875-6. Vol. 3. New York. 8vo. *Hurd & Houghton*. \$4.00.
- , Preventive Medicine in relation to the Public Health. Being Lectures and Addresses delivered at St. Thomas's Hospital and elsewhere. Revised by the Author. Alfred Carpenter. London. 8vo. *Nimble*. 6s.
- Hospitals: Their History, Organization and Construction. W. Gill Wylie. New York. 8vo. *Appletons*. \$2.50.
- Hydraulic presses and other Hydraulic machinery: Notes for users of ——. Compiled by E. Howard. London. *Hayward, Tait & Co., Upper Whitecross St.* 2s. 6d.
- Island and Sorrento Work. A complete Manual of —: Scroll sawing, Silhouettes and House Ornamentation. Arthur Hope. 3d ed. Chicago. 8vo, illus. *John Wilkinson*. Cloth, \$1.25. Paper, \$0.50.
- Iron and Steel. The prehistoric use of ——. St. John V. Day. London. 8vo. *Trübner*. 12s.
- Machine design, the elements of —: an introduction to the principles which determine the arrangements and proportions of the parts of machines, and a collection of rules for machine designs. W. Cathorne Unwin. New York. 12mo. *Appletons*. \$1.50.
- Machinery. Illustrated Handbook of —. C. J. Appleby. London. *Spens*. Section 1, Prime Movers. 3d ed. 8vo. 2s. Section 2, Hoisting and Machinery. 3d ed. 8vo. 3s. 6d.
- Markets. Designs for the Construction of —, Warehouses and Sheds. A. Friedmann. Trans. by E. H. d'Avigder. London. Folio, illus. *Spens*. 42s.
- Mathematical Exercises. With Tables, Formulae, Answers, and References. S. H. Winter. New ed. London. 12mo. *Longmans*. 6s. 6d.
- Mathematical Instruments. Comprising Drawing, Measuring, Optical, Surveying, and Astronomical Instruments. J. F. Heather. Enl. ed., with illus. *Weales Series*. London. *Lockwood, Crosby & Co.* 4s. 6d.
- Mathematical Tables and Logarithms. Charles Hutton. New ed. London. Royal 8vo. *Whittaker*. 12s.
- Mechanics, The practical Dictionary of —. Containing 15,000 Drawings of Machinery, Instruments, and Tools in Use by every Profession and Trade, with Comprehensive and Technical Description of every subject. Complete in 3 vols. London. Super royal 8vo. *Cassell, Petter & Galpin*. £3 3s.
- Military Examinations. Examination Papers set at the Open Competitions for Admission to the Royal Military Academy, Woolwich, and the Royal Military College, held under the Direction of the Civil Service Commissioners, in July, 1877; together with Regulations and Tables of Marks. London. 8vo. *British Government Publications*. 1s. 6d.
- Mill Gearing; practical Treatise on —, &c., for Engineers. T. Box. London. Post 8vo. *Spens*. 7s. 6d.
- Minerals, Tables for the Determination of —, by those physical Properties ascertainable by the aid of such simple instruments as every student in the field should have with him. Based on the Tables of Weisbach. By Persifor Frazer, Jr. New and revised edition. Philadelphia. 12mo. *Lippincott*. \$2.00.
- Mineral Surveyor and Valuer's Complete Guide. By William Lintern, Mining and Civil Engineer. With four plates of Diagrams, Plans, &c. *Weales Series*. London. *Lockwood Crosby & Co.* (Announcement.)
- Mining; a descriptive Treatise on Mining, Machinery, Tools, and other Appliances used in Mining. George Q. Andre. Vol. 1. London. 4to. *Spens*. 26s.
- Perspective, Elementary —, Explained and Applied to Familiar Objects. For the Use of Schools and Beginners in the Art of Drawing. By M. J. Keller, School of Design, University of Cincinnati. Cincinnati. 12mo. *Robert Clarke & Co.* (Announcement.) \$0.75.
- Photography: History and Handbook of —. Translated from the French of Gaston Tissandier. Edited by J. Thomson. Woodcuts and Specimens of Prints by the best permanent Processes. Second and revised edition, with Appendix by Henry Fox Talbot, giving Account of his Researches.

London. Imp. 16mo, illus. *Low, Sampson & Co.* (Announcement.) 6s.
 Portland Cement; practical Treatise on the Manufacture of —. Henry Reid. New York. *Spons.* (Announcement.)
 Pyramid; a Miracle in Stone, or the Great — of Egypt. Joseph H. Seiss. Philadelphia. 12mo. *Porter & Coates.* \$1.25.
 Railway Revenue, and its Collection. Containing Rules and Regulations necessary to insure faithful accounting, and explaining generally the object and extent of railway accounts, and the necessity of their being organized upon Scientific Principles. Marshall M. Kirkman. New York. 12mo. *Railroad Gazette.* \$2.50.
 Resistance of Materials; a Treatise on — and an Appendix on the Preservation of Timber. De Volson Wood. 3d ed., revised. New York. 8vo, illus. *Wiley & Sons.* \$3.00.
 Rocks; a Guide to the Determination of —; being an Introduction to Lithology. Edward Jannettaz. Translated by George W. Plimpton. 12mo, illus. *Van Nostrand.* \$2.00.
 Steam Engineering; a new Treatise on —; physical Properties of permanent gases and of different kinds of Vapor. John W. Nystrom. New ed. New York. *G. P. Putnam's Sons.* \$2.50.
 Steam; Elementary Treatise on — and the

Use of the Indicator. J. C. Graham. New York. *Spons.* (Announcement.)
 Telephone, The; an Account of the Phenomena of Electricity, Magnetism, and Sound, as involved in its action; with Directions for making a Speaking Telephone. Prof. A. E. Dolbear, of Tufts College. Boston. 16mo. illus. *Lee & Shepard.* \$0.75.
 Textile Fabrics. Ornamental — of all Ages and Nations. A practical Collection of Specimens. 50 Plates, in gold and silver colors, comprising upward of 1,000 various styles of Ancient, Mediæval, and Modern Ornamental Designs of Textile Fabrics; with Explanatory Descriptions and a general introduction. Dupont & Auberville. 1 vol., folio, cloth gilt, extra. *Van Nostrand.* \$40.00.
 Thermo-dynamics. R. Wormell, Head Master of the City of London Middle-class Schools. London. Fcap 8vo, illus. *Longmans.* (Announcement.) 1s. 6d.
 Topographies, Country —. Edited by E. R. Kelly, M. A., Wiltshire; with Map engraved expressly for the work. London. 8vo. *Kelly.* 5s.
 Tramways. Report from the Select Committee on Tramways (use of mechanical power); together with the Proceedings of the Committee, Minutes of Evidence, &c. Folio paper. London, 1877. *Van Nostrand.* \$1.50.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Julius W. Adams, Brooklyn :
 Report of Referees and their opinion in case of W. C. Kingsley and A. C. Keeney, against the City of Brooklyn. In City Court of Brooklyn, Aug. 4, 1877.

From A. Anderson, Chicago :
 Report of Receiver, case of Foadick and Fish against the Chicago, Danville & Vincennes R. R. Co. In Chancery. U. S. Circuit Court, Northern District of Illinois. A. Anderson. Chicago. 1877.

From Blake Crusher Company, New York:
 Prize Essay on Roads and Road-making. Clemens Herschel. New York. 1877. (Several copies.)

From Boston Public Library:
 Bulletin No. 43. October, 1877. Boston Public Library. Boston.

From Geo. H. Forster, New York :
 Testimony taken before the Canal Investigating Committee at the Capital. State of New York. Reported Phonographically. New York. 1875.

From Schuyler Hamilton, New York :
 Our National Flag, the Stars and Stripes, its History in a Century. Schuyler Hamilton. New York. 1877. (Several copies.)

From Institution of Engineers and Shipbuilders in Scotland :
 Transactions of the Institution. Vol. XX. Twentieth Session, 1876-7. Edited by the Secretary. Glasgow. 1877.

From W. H. McFadden, Philadelphia :
 Annual Report of the Chief Engineer of the Water Department of the City of Philadelphia for the year 1876. W. H. McFadden. Philadelphia. 1877.

From E. Pontzen, Vienna :
 Report on Centennial Exhibition at Philadelphia. Published by the Austrian Commission. Part 13. The Railroads in the United States, with particular regard to the Depots, the mechanical construction of the Coaches and the course of railways through cities. Ernest Pontzen. Vienna. 1877. (German.)

From Francis Rziha, Vienna :
 Report on Centennial Exhibition at Philadelphia. Group 18, Section 2. Underground and Elevated Railways. Part III. Elevated Railways. Francis Rziha. Vienna, 1877. (German.)

From J. D. Van Buren, Jr., Albany :
 Annual Report of the State Engineer and Surveyor of the State of New York, and of the Tabulations and Reductions from the Report of railroad corporations for the year ending Sept. 30, 1876. J. D. Van Buren, Jr. Albany. 1877.

From D. Van Nostrand, New York :
 Van Nostrand's Science Series. No. 31. The sanitary condition of City and Country Dwelling Houses. George E. Waring, Jr. New York. 1877.

Van Nostrand's Science Series. No. 32. Cable Making for Suspension Bridges with special reference to the Cables of the East River Bridge. W. Hildenbrand. New York. 1877.

From John Whitelaw, Cleveland :
 Twenty-first Annual Report of the Board of Trustees of Water Works to City Council of Cleveland, with Reports of the Officers of the Board for 1876. Cleveland. 1877. (2 copies.)

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III, November, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

ANNUAL MEETING, NOVEMBER 7TH, 1877.—The twenty-fifth annual meeting was called to order at 10½ A. M., President George S. Greene in the chair. The following members were present during the session :

Messrs. Adams, Aldrich, Avery, John W. Bacon, J. G. Barnard, Baxter, Beardsley, L. F. Beckwith, Bissell, Bogart, Brush, T. C. Clarke, Chanute, Chittenden, Collingwood, Compton, Cooper, Coryell, Croes, H. Crosby, W. Crosby, T. G. Ellis, Emery, Endicott, Forney, Godwin, G. S. Greene, R. L. Harris, Haswell, Hering, Holley, Hutton, Kingsley, Leverich, T. J. Long, Macdonald, C. L. McAlpine, W. J. McAlpine, Morison, J. O. Morse, O. F. Nichols, North, Owen, W. H. Paine, Prout, A. J. Post, Roberts, Schott, Schuyler, Searles, Sedgwick, Shinn, Spielman, Striedinger, Thurston, Van Winkle, Walling, C. D. Ward, L. B. Ward, D. V. Wood, Worthen and Yardley.

The Secretary, Mr. Leverich, presented and read the Annual Report of the Board of Direction,* which was accepted.

The President stated that, under the perfected organization of the Society, as referred to in the Report of the Board of Direction, the law of the State required the appointment of Trustees for one year. In order to avoid any confusion, and to have the term of office expire with

* See page 113.

the Society year, the officers acting as Trustees had resigned such office, to take effect this day.

The Secretary read the resignation as follows :

We hereby resign our office as Trustees of the American Society of Civil Engineers, as appointed under Act of Incorporation, filed in the office of the County Clerk of the City and County of New York, April 17th, 1877, such resignation to take effect on the first Wednesday of November, 1877.

GEORGE S. GREENE,
A. L. HOLLEY,
THEO. G. ELLIS,
G. LEVERICH,
JOHN BOGART,

W. H. PAINE,
JAMES O. MORSE,
M. N. FORNEY,
W. MILNOR ROBERTS,
J. JAMES R. CROES.

Mr. Shinn offered the following resolution :

Resolved, That the resignation of the officers of the Society as Trustees of the Society, under the act of the Legislature of April 12th, 1848, this day presented, be, and the same is hereby accepted, to take effect when their successors are elected.

Resolved, That the officers this day elected shall be the Trustees of the Society for the balance of the term of their predecessors, whose resignation is this day accepted, and until their successors shall be duly elected under Article 5 of the Constitution of the Society.

After discussion the resolution was passed.

The President then presented the report of the Board of Censors to award the Norman Medal.* This medal was thereby awarded to Mr. W. W. Maclay, he being the author of a paper entitled "Notes and Experiments on the use and testing of Portland Cement." Books to the value of the medal were awarded to Mr. Julius H. Striedinger, he being the author of a paper entitled "On igniting blasts by means of Electricity."

The Treasurer's Annual Report was then read,† and referred to the Finance Committee.

The Treasurer, Mr. John Bogart, also stated that the Society had been unable, for a number of years, to obtain interest on certain stock of the New York Central Railroad belonging to the Society, owing to the loss, many years ago, of the certificate. There were delays in taking legal steps to recover this stock, on account of the expressed intention of the railroad company to contest a suit and to carry the case to the Court of Appeals. The former Treasurer of the Society, Mr. James O. Morse, deemed it injudicious to involve the Society in such a suit. Similar cases have, however, since been decided, and legal proceedings are now pending to recover the stock. A bond must be given to secure the company against loss by the possible presentation of the original certificate by other parties.

* See page 124. † See page 126.

The following tellers were appointed :—For counting the ballots for election of officers, C. Ridgley Schott, William R. Hutton and Robert L. Harris.

For counting the ballots for admission of new members, Wilson Crosby and Charles B. Brush.

Mr. W. Milnor Roberts, chairman, presented the report of the Committee on Finance,* which was accepted.

The Secretary presented the report of the committee on time and place of the next Annual Convention.†

Letters were read in reference to this subject from Messrs. Frederick Brooks and Joseph P. Davis, members of this Society, and from Mr. C. Frank Allen, member of the Boston Society of Civil Engineers.

Mr. W. P. Shinn moved that the next Convention of the Society be held in Boston.

Mr. Robert L. Harris moved to amend by substituting San Francisco.

After discussion the amendment was lost, and the original motion, naming Boston, was carried.

The decision of the time for holding the Convention was referred to the Board of Direction.

Mr. T. G. Ellis, chairman of the Centennial Commission of the Society, verbally reported progress, and stated that sub-committees of the Commission were engaged in the preparation of memoirs which would be presented to the Society. No formal action in reference to the Paris Exposition had yet been taken by the full commission. Its members now present, however, had agreed to assume the editing of reports that might be sent from Paris, but no provision had been made either for representation there or the preparation of special memoirs. The Commission asked to be continued. On motion, it was so ordered.

The report of the Committee on Gauging of Streams was presented by the chairman, Mr. J. J. R. Croes,‡ and read. On motion, the report was received and the committee continued.

The report of the Committee on Metric System of Weights and Measures was then presented and read.§

Mr. Croes moved that the Committee be continued, which was lost.

After discussion, Mr. T. G. Ellis moved that the further consideration of the Metric System of Weights and Measures be indefinitely postponed and that this question be submitted to letter ballot, which was carried.

Mr. W. P. Shinn, Chairman of the Committee on Resistances of Railway Trains reported verbally that since the last annual meeting, Mr. Dudley, whose operations with the Dynograph were to be the basis of investigations, had been continuously employed by the Eastern Railway Association in reference to patent suits which are pending.

It had been determined upon by the Committee to request the leading railway companies to unite in the employment of Mr. Dudley, un-

* See page 125. † See page 124. ‡ See page 123. § See page 124.

der the direction of the Committee, to make a certain range of experiments in regard to economical features of railway transportation.

Some progress has been made, but the present engagement of Mr. Dudley has been much more prolonged than was anticipated and may continue several months. The information already obtained by him cannot be made public until used in the pending suits. The Committee submits the question of its continuance to the Society.

On motion the Committee is continued.

A reconsideration of the vote discontinuing the Committee on Metric System of Weights and Measures was moved. Decided by the Chair to be out of order, and, on appeal, the decision of the Chair was sustained.

Mr. W. P. Shinn, Chairman of Committee on Uniform Accounts and Returns of Railway Companies presented its report* which was read and accepted and the Committee continued.

The Report of the Committee on Tests of American Iron and Steel† W. Sooy Smith, Chairman, was presented and read.

Mr. Thurston gave an account of what had been done since the date of the statement referred to in the report. He stated that Congress, having done nothing, the work of the Board in its general form stands now just as it then did. The committees are finishing the details necessary to make their reports. The Committee on Chemical Research has had a large number of specimens, particularly of steel, analyzed. The analyses are made with an unusual degree of accuracy, and the result is a quantitative determination of the elements which enter into the composition of the specimens in such minute quantities that chemists do not usually regard them. It is hoped to determine by these analyses what the exact influence is of each of these elements. Altogether, about one thousand samples of steel have been forwarded to be made into test pieces. About one-sixth have been tested, the remainder will be as soon as Congress furnishes funds.

The Committee on Wrought Iron and Rails has made some four or five hundred pages of manuscript reports. The Committee on Beams and Girders has been making experiments at Buffalo and a report is in preparation. The Committee on Tool Steels has continued the work heretofore indicated. The Committee on Metallic Alloys has prepared a report of 650 pages of manuscript, with a large collection of plates and tables of results. The report of the Committee on Composite Alloys is also ready. Several other reports are also in preparation and experimental work will proceed if funds are provided for it.

The testing machine is not yet set up and will not be till there is money to do it.

The work of the committees is in such shape that individual members who have taken charge of it can complete their special work if the Board expires as a Board. The immense amount of work that has been done

* See page 123. † See page 123.

will not be lost, but a change of method or the attempt to secure funds by private subscription would involve great toil. The report of the Board will be made to the President next month and will be published as a public document. The expense incurred for the machine, except for setting it up, is provided for, and that, also, can be provided if there is any prospect of its being used. The principal parts of the machine are at Chicopee, the other parts at Watertown.

Amendments to the Constitution were then considered and fully discussed, and it was ordered, by a vote in each case, that the recommendations stated below for each amendment should be transmitted to the Society, with the ballot list.

It was recommended that the following amendment should be adopted :

ARTICLE XIX.—For "two" insert "five," and for "thirty" insert "twenty-five." The article will then read :

All candidates for admission to the Society must file statements, by themselves, setting forth the grounds of their claim to be elected ; be proposed by at least five members of the Society, to whom they must be personally known, and a notification of the same sent to each member whose address is on record. Each proposition, with the names of the proposers, must be posted in some conspicuous place in the rooms of the Society for at least twenty-five days before being submitted to vote. All papers and applications shall be laid before the Board of Direction, and be reported upon, previous to action by the Society.

It was recommended that the following amendment should not be adopted :

ARTICLE XX.—For "thirty" insert "twenty-five," and for last clause insert as below. The article will then read :

In elections for membership, of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after twenty-five days have elapsed from the time of mailing the notification. Negative ballots exceeding five per cent. of the total number canvassed shall exclude.

It was recommended that the following amendment should be adopted :

ARTICLE XX.—In elections for membership of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after thirty days have elapsed from the time of mailing the notification. Five or more ballots cast in the negative shall exclude. Members notified, but not responding, shall be classed as voting in the affirmative.

It was recommended that the following amendment should not be adopted :

ARTICLE XX.—For "three" insert "ten;" the article otherwise will read as the preceding.

It was recommended that the following amendment should not be adopted :

ARTICLE ——. (A new article).—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, or who from ill health, advanced age, or other good reason assigned, has a scanty income ; and the Board may remit the whole or part of assessments in arrears, or accept in lieu thereof desirable additions to the Library and Museum.

It was recommended that the following amendment should not be adopted :

ARTICLE —. (A new article):—Upon the written request of ten or more members that, for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and, if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defence made, may then expel the accused. Such action shall be stated to him and the Society, and this shall be in any event the only public announcement of the matter.

It was recommended that the following amendment should be adopted :

ARTICLE —. (A new article):—Upon the written request of ten or more members, that for cause therein set forth a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defence made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member, and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall in any event, be the only public announcement of the matter.

It was recommended that the following amendment should be adopted :

ARTICLE XXII.—Persons thus elected and duly qualified, who reside within fifty miles of the post-office in the City of New York, shall be deemed resident; and those who reside beyond this limit shall be deemed non-resident. The membership of any person shall begin on the day of his election.

It was recommended that the following amendment should be adopted :

ARTICLE XXIX. (To read):—Members who become residents or non-residents by removal into or beyond the limits prescribed in Article XXII, shall be subject to assessments in the class in which they were on the day of the annual meeting, as may appear upon the records of the Society or by written notice to the Secretary.

It was recommended that the following amendment be adopted :

ARTICLE —. (A new article):—Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

Amendments to the By-Laws were then considered. After discussion the following proposed amendments were referred to the Board of Direction :

SECTION 20. *First*.—The Treasurer shall deposit the moneys and invest the funds of the Society, in its name, by and with the advice of the Board of Direction; he shall draw all checks, which shall be signed by him and the President or Chairman of the Committee on Finance and countersigned by the Secretary.

SECTION 20. *Second*.—The Treasurer, before he shall enter upon his duties, shall give a bond for the faithful discharge thereof to the amount of \$5,000, with sureties therefor who shall be approved by the Committee on Finance. All moneys which he may receive shall be immediately deposited to the credit of the Society, in such bank as the Committee on Finance shall direct.

None of the moneys, securities or other property of the Society shall be paid out or incumbered, except for the payments of bills and accounts which have been duly examined and approved by the Committee on Finance, and no moneys shall be withdrawn except for such duly approved bills and accounts drawn by the Secretary and approved by the Committee on Finance in favor of the person to whom such moneys are due.

The following amendment was adopted :

SECTION —. (A new section): In all cases where the By-Laws or resolutions of the Society or of the Board of Direction require specific duties to be performed by the President, the senior Resident Vice-President present shall perform such duties in absence of the President, on receiving notice from the President to perform such duties.

The following amendment was adopted :

SECTION 33. (To read):—Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast shall be necessary for the adoption of any such addition or amendment.

The resolutions offered October 3d, 1877,* and October 18th, 1877,† in reference to the duties of the Secretary, were referred to the Board of Direction.

The resolutions offered October 18th, 1877,‡ in reference to duties of Engineers under certain specified circumstances, were referred to the Board of Direction.

The following resolution was offered by Mr. Walling, and was passed :

Resolved, That it is inexpedient for this Society to instruct its members as to their duties in private professional matters.

The tellers of the vote for election of members made their report, and the following candidates were declared elected : Members—Charles O. Brown, of New York (became Junior, February 16th, 1875) ; and Frederick W. Clarke, of Chicago. Junior—Charles W. Raymond, of New York.

The report of the Committee on Nomenclature and Classification of Masonry,§ was presented by the Chairman, Mr. J. J. R. Croes.

The report of the Committee on Quarters for the Society,|| was presented by the Chairman, Mr. Bogart.

On motion, the committee was continued.

Mr. Walling presented a form of memorial to Congress in reference to extending the triangulations of the United States coast survey.¶

On motion, it was directed that the memorial should be submitted to the Society by letter ballot.

Mr. Collingwood offered the following amendment to the Constitution, which was seconded :

ARTICLE — (A new Article). The Board of Directors may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, or who, from ill

* See Proceedings, page 90. † See Proceedings, page 100. ‡ See Proceedings, pages 100 and 101. § See page 122. || See page 125. ¶ See page 127.

health, advanced age, or any other good reason assigned, is unable to pay such dues : and the Board may remit the whole or part of assessments in arrears, or accept, in lieu thereof, desirable additions to the Library or Museum.

The following amendment to Section 30 of the By-Laws, offered by Mr. Herschel, was presented and seconded :

SECTION 30.—(To read).—Special committees, to report on engineering subjects, shall be authorized only by a majority of the votes cast by the Society, and in the following manner : Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument against the appointment of such committee. The mover of the resolution under consideration shall be invited to present the arguments for the same under a limit of occupying no more than one-half page of the printed proceeding in their presentation ; the same limit to obtain also in the case of the arguments against. Said invitation shall be extended to the mover at least one month before the argument is needed to go upon the letter ballot ; and if not furnished by that time, no argument for the resolution shall be presented. The statements of argument shall be printed and issued to the Society with letter ballot ; or, if the Board fails to report within one month, the letter ballot shall be issued without comment ; or the Society may vote by ballot at the Annual Meeting or in Annual Convention upon such resolution, within one month after it has been submitted to the Board of Direction. No mover of a resolution shall serve in the presentation of arguments *against* a resolution under this By-Law while the resolution offered by him is pending a vote of the Society.

The tellers to canvass the vote for officers of the Society presented their report, and the following were declared elected : E. S. Chesbrough, President ; W. Milnor Roberts and Albert Fink, Vice-Presidents ; J. James R. Croes, Treasurer ; William H. Paine, Joseph P. Davis, George S. Greene, C. Shaler Smith, and C. Vandervoort Smith, Directors.

No person having received a majority of all the votes cast for the offices of Secretary and Librarian, a ballot was then taken. The tellers to canvass the vote made their report, and John Bogart was declared elected Secretary and Librarian.

The thanks of the meeting were presented to the canvassers of the votes for members and for officers.

It was moved, seconded, and unanimously carried, that the thanks of this Society be presented to Mr. G. Leverich, the retiring Secretary, who has for so many years discharged the duties of that office.

Adjourned.

THE
ANNUAL REPORT OF THE BOARD OF DIRECTION,
FOR YEAR 1876-7.

PRESENTED NOVEMBER 7TH, 1877.

The Board of Direction, in compliance with Article XII of the Constitution, herewith presents a "Report on the affairs of the Society, embracing the Report of the Treasurer" for the term from November 1st, 1876, to November 6th, 1877 :

On November 1st, 1876, the membership was :—

Honorary Members, resident.....	2	Non-resident.....	4	Total	6
Corresponding " .....	..	" .....	3	"	3
Members, resident	113	"	304	" ..	417
Associates, "	5	"	11	" ..	16
Juniors, "	7	"	44	" ..	51
Making "	127	"	366		494
Fellows, 70—of whom 10 are Members and 1 Honorary Member, leaving.....					59
Total then connected with the Society.....					552

To-day the membership is :—

Honorary Members, resident.....	2	Non-resident.....	4	Total	6
Corresponding " .....	..	" .....	3	"	3
Members, resident	110	"	326	" ..	436
Associates, "	4	"	12	" ..	16
Juniors, "	9	"	47	" ..	56
Making "	125	"	392		508
Fellows, 68—of whom 10 are Members and 1 Honorary Member, leaving.....					57
Total now connected with the Society.....					574

On November 1st, 1876, the number of proposals for admission to the Society, then pending was 6 ; the number during the year past was 43 ; of this number 27 were elected as Members (of whom 2 were transferred from Associates), 2 as Associates and 5 as Juniors ; 5 were laid on the table or withdrawn and 8 are pending.

7 Members and 1 Fellow elected before November 1st, 1876, and 24 Members, 2 Associates and 5 Juniors, elected since, have qualified.

The increase during the Society year has been :—

Members, admitted, 31—less resigned, 4—died, 7.....	20
Associates, " .. 2 " transferred, 2.....	
Juniors, " .. 5 " resigned, 1.....	4—24
Fellows, " .. 1 " died, 3, decrease.....	2
Total " .. 39, less transferred, 2—resigned, 5—died, 10.....	22

18 meetings of the Society were held during the year, one of which was the Ninth Annual Convention ; 9 were regular and 2 adjourned meetings, at which ballots for members were canvassed and other business done, and 6 were "stated" meetings, when papers were read and discussions had upon engineering subjects, and generally time given for discussion.

20 stated and special meetings of the Board were held during the year, generally for examination into the qualifications of candidates for membership, the application of the Society's funds, and similar general business of the Association.

The Ninth Annual Convention was held in New Orleans, April 24th and 25th, followed by visits to interesting points in the city, and excursions to the jetties at the mouth of the Mississippi and to the Bonet Carré Crevasse.

Members of the Boston Society of Civil Engineers, of the Civil Engineers' Club of the Northwest, of the Civil Engineers' Society of St. Louis, and of this Society, were in attendance.

Full reports of the proceedings have been published in "Transactions."

Papers were presented to the Society, during the year, as follows :

Notes on the Masonry of the East River Bridge. Francis Collingwood.

On the Rate of Set and Decrease of Resistance of Metals subject to distortion. Robert H. Thurston.

Levees, Discussion (incomplete). George W. R. Bayley.

Co-ordinate Surveying. Henry F. Walling.

Failure of the Ashtabula Bridge. Charles Macdonald.

The Simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses. J. H. Striedinger.

American Society of Civil Engineers and its Future. W. Milnor Roberts.

Wing Dams in the Mississippi, above the Falls of St. Anthony. Edward P. North.

Cushioning the reciprocating Parts of Steam Engines. John W. Hill.

Description of a Design for a Steam Vacuum Pump. William H. Lotz.

Description of recent Tests of the New Iron Bridge over the Kentucky River, on line of the Cincinnati Southern Railway, L. G. F. Bouscaren.

Details of Methods of Determining the Slope of the Mississippi River, from New Orleans to the Gulf. E. L. Corthell.

Flow of Water in open Channels. Theo. G. Ellis.

Improvement of Entrance to Galveston Harbor. Charles W. Howell.

Novel Railway Survey. Thomas S. Hardee.

Patents and Patent Laws, Inventions, Inventors and Authors. C. G. Forshey.

Relative Quantities of Material in Bridges of different Kinds, and of Various Heights. Charles E. Emery.

Results of recent Test Levels on the Line of the Erie Canal. William H. Searles.

Consideration of the Impact of a Falling Body. Charles H. Haswell.

On a New Type of Steam Engine, theoretically capable of Utilizing the full mechanical Equivalents of Heat Energy, and on some Points in Theory, indicating its Practicability. Robert H. Thurston.

Reports were made to the Society, during the same time, as follows :

Annual Report of the Board of Direction on the affairs of the Society, for year ending October 31st, 1877.

Award of the Norman Medal. George S. Greene, Chairman.
Time and Place of the Ninth Annual Convention. G. Leverich, Chairman.
Tests of American Iron and Steel (2 reports). W. Sooy Smith, Chairman.
Gauging of Streams. J. J. R. Croes, Chairman.
Resistances of Railway Trains. William P. Shinn, Chairman.
Uniform Accounts and Returns of Railroad Companies. William P. Shinn, Chairman.
Centennial Commission of the Society. Theodore G. Ellis, Chairman.
Centennial Commission of the Society, Committee on Finance (2 reports). W. Milnor Roberts, Chairman.
Committee on Finance, on Report of the Treasurer. W. Milnor Roberts, Chairman.
Metric System of Weights and Measures. Clemens Herschel, Chairman.
Quarters for the Society. John Bogart, Chairman.

Discussions were had on many of these papers and reports, when read before the Society ; also on the following subjects :

Levees, as a System of Reclaiming Low Lands.
Preservation of Timber.
Eye-Bars.
Connected-Arc Marine Boilers.
Mount Washington Railway, its Construction and Operation.
Cut-offs of the Mississippi River, their Effect on the Channels above and below.
Efficiency of Steam Vacuum Pumps.

Many of these papers, reports and discussions have been published in Transactions and Proceedings during the year, also these papers presented last year :

A Cheap Transfer Table. William P. Shinn.
Principles of Tidal Harbor Improvements, as applied at Wilmington, Cal. Clinton B. Sears.
Reconstruction and Enlargement of Cork Run Tunnel, on the Pittsburg, Cincinnati & St. Louis Railway. M. J. Baker.
Memoir of American Engineering. John B. Jervis.
Discussion on the Croton Water Works, and Supply for the Future. J. J. R. Croes.
A Water Conduit under Pressure. John T. Fanning.
Consumption and Waste of Water delivered by Public Works. J. H. Harlow.

Referring to the lists of papers presented to the Society, which were unpublished at the date of last report of the Board ; of these, the following were published during the past year :

Efficiency of Steam Vacuum Pumps. J. Foster Flagg.
Approximate Determination of Stresses in the Eye-Bar Head, William H. Burr.

The following presented, and not published during the year, are to be added to the list :

Levees, a Discussion. George W. B. Bayley.
American Society of Civil Engineers and its Future. W. Milnor Roberts.
Cushioning the Reciprocating Parts of Steam Engines. John W. Hill.
Description of a Design for a Steam Vacuum Pump. William H. Lotz.
Description of recent Tests of the new Iron Bridge over the Kentucky River, on Line of the Cincinnati Southern Railway. L. G. F. Bouscaren.
Details of methods of Determining the Slope of the Mississippi River, from New Orleans to the Gulf. E. L. Corthell.
Patents and Patent Laws, Inventions, Inventors and Authors. Caleb G. Forshey.
Results of recent Test Levels on the Line of the Erie Canal. William H. Searles.
Consideration of the Impact of a falling Body. Charles A. Haswell.
On a new Type of Steam Engine, theoretically capable of utilizing the full mechanical Equivalents of Heat Energy, and on some Points in Theory, indicating its Practicability. Robert H. Thurston.

In addition to these, are several reports of Committees, upon a number of subjects, which are still unpublished.

Some papers which were presented to the Society during the year, appeared to the Committee on Library to fall under the clause of the 16th By-law, which precludes from publication certain matter, and the Committee declined to publish them. The question at issue appears to be an important one, as affecting the standard of the publications of the Society. The Board of Direction are not unanimous in sentiment on the subject.

The ground taken by the Committee may be thus stated :

It is not the aim of our publications to supply a medium for the description of untried projects or theories. We want to know, not what a man has imagined will work satisfactorily, but what he has actually accomplished in reducing the cost of work, or increasing its efficiency. If a machine or a structure has been built, and has either succeeded or failed, it is interesting and valuable to know the reasoning which led to the adoption of the type which was followed in its construction, but until a result has been reached in actual experiment, we are not justified in spending the money of the Society in publishing speculations as to what ought to happen under certain conditions, but which never has happened.

The Board, without endorsing these views, submits them to the members.

The Proceedings contain, in addition to the reports mentioned :

Announcement of Meetings to be held. Topics discussed, &c.

Book Notes. Short Articles on:—

Analytical Mechanics.

Iron Highway Bridges.

Reports of the Vienna International Exhibition.

List of Additions to Library and Museum.

List of Members, with Addresses, Changes and Corrections.

Minutes of Meetings of the Board of Direction and of the Society.

List of new and technological Books.

Notes and Memoranda. Short Articles relating to

American Tunneling.

Centennial Commission of the Society.

Dams for Reservoirs.

Metric System of Weights and Measures.

Mount Washington Railway.

Ninth Annual Convention.

Tests of American Iron and Steel.

Water Supply from Bronx River.

Statement of the Finances of the Society.

Volume V of Transactions and Volume II of Proceedings closed with the December number, and an Index and Title Page for each has been issued. The index for the latter being full and specific.

As appendix to Translations, the following have been received during the year :

Discussions on Technical Education, at the Washington meeting of Am. Ins. of Mining Engineers, and at a joint meeting in Philadelphia with the Am. Soc. of Civil Eng., by arrangement between the two associations.

Report of the Chief Engineer of the New York and Brooklyn Bridge, January 1st, 1877, by courtesy of the Engineers.

A late ruling of the Postal Department prevents further issue of matter which is not printed and paged with Transactions. Copies will, however, be distributed to Members in the ordinary way, upon payment of necessary expenses for postage.

During the year the Library has been increased by the contributions of the members and others interested in its growth, the addition of the collection made by the Centennial Commission of the Society during the International Exhibition in Philadelphia, and by purchase.

There has been added in that time :

Books, bound and unbound, and pamphlets.....	1019
Manuscripts (bound volumes).....	5
Maps, plans, drawings, charts, photographs and engravings.....	702
Models and specimens.....	33

These do not include magazines and papers contributed to the Society by publishers or received in exchange for Transactions, as follows :

Annales des Ponts et Chaussées.....	Quarterly,	Paris.
Deutsche Bauzeitung.....	Semi-Weekly,	Berlin.
Engineering News.....	Weekly,	Chicago.
Engineering.....	"	London.
Iron.....	"	"
Journal of the American Iron and Steel Association.....	"	Philadelphia.
Journal of the Society of Arts.....	"	London.
Manufacturer and Iron World.....	"	Pittsburgh.
Monthly Record of Scientific Literature.....	Monthly,	New York.
Official Gazette of the United States Patent Office.....	Weekly,	Washington.
Railroad Gazette.....	"	New York.
Stummer's Ingenieur.....	"	Vienna.
The American Architect and Building News.....	"	Boston.
American Chemist.....	Monthly,	New York.
Army and Navy Journal.....	Weekly,	"
Builder.....	"	London.
Building News and Engineering Journal.....	"	"
Chicago Railway Review.....	"	Chicago.
Commissioners of Patents Journal.....	Semi-Weekly,	London.
Engineer.....	Weekly,	"
Engineering and Mining Journal.....	"	New York.
Iron Age.....	"	"
Journal of the Franklin Institute.....	Monthly,	Philadelphia.
Manufacturer and Builder.....	"	New York.
Polytechnic Review.....	Weekly,	Philadelphia.
Railway Age.....	"	Chicago.
Railway World.....	"	Philadelphia.
Telegraphic Journal and Electrical Review.....	Semi-Monthly,	London.
Van Nostrand's Eclectic Engineering Magazine.....	Monthly,	New York.

The following are subscribed for :

Allgemeine Bibliographie für Deutschland.....	Weekly,	Leipzig.
Bibliographie de la France.....	"	Paris.

Bookseller.....	Monthly,	London.
Publishers' Weekly.....	Weekly,	New York.
Scientific American, with Supplement.....	"	"
United States Official Postal Guide.....	Quarterly,	Boston.
American Library Journal.....	Monthly,	New York.
American Bookseller.....	Semi-Monthly,	"
Journal of Artillery and Military Engineering.....	Monthly,	Vienna.

The Society has received during the year, in exchange for its "Transactions," official publications of the following associations, in some instances for preceding years:

American Institute of Architects.....	New York.
American Institute of Mining Engineers.....	Philadelphia.
Architekten und Ingenieur Verein Zu Hanover.....	Hanover.
Argentine Scientific Society.....	Buenos Ayres.
Associação dos Engenheiros Cívic Portuguezes.....	Lisbon.
British Patent Office.....	London.
Boston Public Library.....	Boston.
Civil Engineers' Club of the Northwest.....	Chicago.
Department of Agriculture.....	Washington.
Engineers' Club of St. Louis.....	St. Louis.
Esayons' Club, Engineer Corps, U. S. A.....	Willet's Point.
Hanover Society of Architects and Engineers.....	Hanover.
Hungarian Society of Engineers and Architects.....	Buda Pest.
Institution of Civil Engineers.....	London.
Institution of Engineers and Shipbuilders of Scotland.....	Glasgow.
Institution of Mechanical Engineers.....	Birmingham.
Institution of Mining and Mechanical Engineers.....	Newcastle.
Iron and Steel Institute.....	London.
Oesterreicher Ingenieur und Architekten Verein.....	Vienna.
Royal United Service Institution.....	London.
Sächsischer Ingenieur und Architekten Verein.....	Dresden.
Society of Engineers.....	London.
Société des Ingénieurs Civils.....	Paris.
Swedish Society of Civil Engineers.....	Stockholm.
Thomason College of Civil Engineers.....	Boorkee.

The following associations also have arranged to exchange with the Society:

Imperial School at Moscow.....	Moscow.
Russian Imperial Technical Society.....	St. Petersburg.

Including the Serials received during the year, and making altogether about 70 unbound volumes, the present state of the Library is somewhat as follows :

Books bound, unbound, and pamphlets.....	6641
Manuscripts.....	90
Maps, plans, drawings, charts, photographs and engravings.....	1796
Models and specimens.....	191

As has appeared in the current list of Additions to the Library and Museum, published in Transactions, much of the increase here noted, has been through the Centennial Commission of the Society. A report of its operations will be presented at this meeting.

As stated in the last Report of the Board: "A catalogue of the Library has been for some time in preparation and is nearly complete. The plan adopted is known as the card system: the general and particular title of the work, author's name, description of style, donor's name (if the work is donated), shelf and case numbers are for each book, treatise, or author, written upon a card; these cards are arranged alphabetically in cases. Under such a system, additions or changes in the catalogue may be easily and promptly made, and the fullest information given regarding any contents of the Library."

While the card catalogue is useful in the Library room, the value of the Library to members will be greatly enhanced by the publication of a printed catalogue of the books. The issue of such a catalogue showing the present condition of the Library would, undoubtedly, result in an increased interest in the Library and large additions to it.

During the past year the finances of the Society have not been such as to warrant any considerable expenditure in this direction. The illness of the Secretary in the early part of the year and the confusion attending the removal and the fitting up of the new rooms, have caused delay.

The thanks of the Society are again due to members for their contributions to the Library; formal acknowledgments of their donations appear regularly in Proceedings.

As remarked in last Report, the Library contains many volumes of papers, journals, and other serial works, sets of reports, pamphlets, and the like, more or less complete, which should be bound, to preserve them as well as to fit them for ready use. It is still deficient in important books of reference, and this deficiency can only be supplied gradually by purchasing such books from time to time as the condition of the treasury permits. More has been done in this direction during the past year than in any previous twelve months.

The Board of Censors to award the Norman Medal, made report at the last Annual Meeting, that a single paper only had been submitted to them, and for reasons stated, declined to make any award.

In compliance with the "Code of Rules," a premium to consist of books, to cost \$70 currency, was in May last, offered for the second best paper to compete for the medal this year.

Another year's experience causes this Board to call again attention to "the desirability of a change in the conditions of award of this medal, so that papers read before the Society during the year, as well as those specially prepared for competition, may be eligible for the prize."

Committees at the beginning of the past Society year, charged with the examination of special professional subjects, were as follows:

On "Tests of American Iron and Steel," appointed June 6th, 1872, W. Sooy Smith, Chairman. This Committee made report at the Annual Meeting and at the Annual Convention, and was continued.

On the "Nomenclature and Classification of Masonry," J. James R. Croes, Chairman, ordered December 1st, 1875. This Committee made report at the Annual Meeting, and was continued.

On the "Gauging of Streams," J. James R. Croes, Chairman, December 1st, 1875. This Committee made report at the Annual Meeting, and was continued.

On "American Engineering at the Centennial Exhibition," Theodore G. Ellis, Chairman, appointed December 1st, 1875. This Committee is elsewhere referred to.

On "Resistances of Railway Trains," William P. Shinn, Chairman, ordered May 3d, 1876. This Committee reported at the Annual Meeting, and was continued.

On "Uniform Accounts and Returns of Railroad Companies," William P. Shinn, Chairman, appointed August 16th, 1876. This Committee reported at the Annual Meeting, and was continued.

On "Metric System of Weights and Measures," Clemens Herschel, Chairman. The work of this Committee is elsewhere referred to.

No similar Committees were appointed during the past year.

The previous location of the Society's rooms seemed to be generally acceptable to members; the lease under which they were held, expired April 30th last, and the large quantity of valuable material accumulated by the Centennial Commission at the Exposition in Philadelphia, had to be cared for, either by storing in bulk, or by arranging so that observers might examine and use it. As indicated in reports of the committees charged with this matter, it was proposed to co-operate with kindred organizations, and either by purchase, or lease on satisfactory terms, thereby secure permanent quarters, specially fitted for the use required, and which shall be reasonably safe from fire.

The action of the existing Committee was reported at the last Convention. The present Society house has been leased up to May 1st, 1879. In the meanwhile it is recommended that the consideration of the best means for securing a permanent location be continued.

At the 23d Annual Meeting, a communication was presented, referring to the adoption of the metric system of weights and measures, and proposing that, whether the Society petition Congress to fix a date—say three years hence—when such shall be the legal system, be submitted to vote of members by letter ballot. After discussion, the matter was laid on the table. Further communications on the subject were offered; and at the Eighth Annual Convention, after discussion, the matter, in specific form, was, under By-Laws relating to appointment of special committees on engineering subjects, referred to the Board, which ordered that the same be submitted to the Society without comment for vote by letter ballot. A majority approving, a committee consisting of Messrs. Clemens Herschel, Robert Briggs, Frederick Brooks, Louis G. F. Bous-

careen, and another (who declined to serve) was appointed under the resolution.

At the Ninth Annual Convention the committee presented a report, embodying a memorial to the Senate and House of Representatives of the United States, and the following resolution :—

Resolved, That the form of memorial submitted be adopted by the Society, be signed by the President and Secretary and transmitted to the two houses of Congress."

The resolution was submitted to the Society for vote by letter ballot, and the memorial was not adopted.

A report from the committee at this meeting is expected.

At the same time this resolution was submitted to vote, other resolutions offered at the Ninth Annual Convention, referring to the enactment by State Legislatures of a law for the inspection of bridges ; what is the best system of weights and measures for the use of engineers in the United States ; the reading of papers at Annual Conventions ; and the division of Annual Conventions into sections were also submitted, and neither was adopted.

Quoting from the last Annual Report of the Board :

"At the Eighth Annual Convention reference was made to a clause in Art. XX of the Constitution providing that 'in the elections for membership of either class * * * three "or more ballots cast in the negative shall exclude," and it was considered whether this number should not be increased ; it being urged that the provision was adopted when there were of voting members about one-tenth of the present number. After debate, the matter was laid upon the table ; one argument against change being, that there is no provision in the Society's laws to get rid of an unworthy member."

At the succeeding Annual Convention, amendments to the Constitution, covering these points were proposed ; these are to be considered at this meeting.

Another amendment to the Constitution was then also proposed, declaring that "the membership of any person shall begin on the day of his election." This, if adopted, will remove the difficulty preventing issue of the certificates of membership, which was referred to in the preceding report of the Board.

Soon after the organization of the Society in 1852, under the name of the American Society of Civil Engineers and Architects, steps were taken to secure its incorporation according to the laws of the State of New York. It subsequently became necessary to legalize the change of the Society's name to its present title, but no record of former proceedings could be found. During the past year, the proper measures were taken whereby the Society was duly incorporated, April 17th, last. The act was approved and perfected by the Board of Direction May 21st, and by the Society June 6th.

The general report of the Treasurer of the Society on the state of its finances for the Society year ending November 6th, 1877, is herewith presented.

Deaths of Members during the year, are announced as follows :

George W. R. Bailey, admitted as Member, July 24th, 1872, who died December 14th, 1876.

Robert L. Cooke, admitted as Member, October 23d, 1872, who died August 11th, 1877.

Charles S. Emack, admitted as Member, January 24th, 1872, who died July 27th, 1877.

Edward W. Ensign, admitted as Fellow, June 23d, 1870, who died October 1st, 1877.

William Grain, admitted as Member, February 16th, 1870, who died January 10th, 1877.

James P. Kirkwood became Member upon the organization of the Society, November 2d, 1852, was a Director and President, who died April 22d, 1877.

Louis Nickerson, admitted as Member, October 29th, 1872, who died May 6th, 1877.

William B. Ogden, admitted as Fellow, March 24th, 1870, who died August 3d, 1877.

Henry Tyson, admitted as Member, July 13th, 1872, who died September 2d, 1877.

J. Butler Wright, admitted as Fellow, May 24th, 1870, who died October 31st, 1877.

Memoirs of the deceased are in preparation, and will be presented in due course.

Respectfully submitted,

G. LEVERICH, Secretary.

REPORTS OF COMMITTEES.

REPORT OF COMMITTEE ON NOMENCLATURE AND CLASSIFICATION OF MASONRY.

PRESENTED NOVEMBER 7TH, 1877.

The Committee appointed to inquire into the feasibility of securing a uniformity of practice in the nomenclature and classification of masonry, respectfully report, that after due consideration of the subject, they are of the opinion that the desired object cannot be obtained suddenly, nor by any direct action of the Society. Considerable diversity of practice exists in different parts of the country which can only be overcome by degrees. Believing that the best method of securing uniform practice will be to set forth certain definite names for tools and classes of work-

manship, and request Members of the Society to use only such names in their specifications and practice generally, until, by custom, they become recognized as representing what is intended, the Committee present herewith a paper containing such names, with descriptions of the tools and work, and recommend that Members of the Society be requested to use them as above suggested.

J. J. R. CROES,

W. E. MERRILL,

E. B. VAN WINKLE,

Committee.

REPORT OF COMMITTEE ON GAUGING OF STREAMS.

PRESENTED NOVEMBER 7TH, 1877.

The Committee appointed to inquire into the feasibility of obtaining for the use of engineers records of systematic gaugings of streams of known water shed, and of the rain-fall on their water sheds, respectfully report, that so far their efforts to secure the coöperation of persons or corporations having charge of works the operation of which involves the use of the waters of a stream, have not met with much success. They take pleasure in stating, however, that the Commissioner of Public Works of New York City, who is a Member of the Society, has promised to furnish the Society with the results of the gaugings of rain fall and flow at three points in the Croton basin, where observations are taken, and also that the Commissioners of the Department of Public Parks of New York have expressed their intention to institute systematic gaugings of the streams under their jurisdiction in the newly annexed portion of the city, to aid in the determination of questions relating to the sewerage and drainage of that district, and have promised to furnish the Committee with the results of the same.

In reply to a request for coöperation, the Secretary of the Smithsonian Institute states that the meteorological observations formerly under his control have been transferred to the Signal Office of the U. S. Army. Professor Henry has kindly promised to furnish to the Society a copy of the new edition of the Smithsonian work on rain-fall in the United States as soon as it is published.

The Committee earnestly request Members who are connected with any works on which observations of the desired kind might be made, to use every effort to have them undertaken. It is not necessary, nor is it advisable, to attempt to begin on too large a scale, or with any effort at extreme accuracy. If only two or three observers can be enlisted at first, their operations and the resulting information will, it is believed, excite the interest of others.

The Committee will gladly aid, by advice and suggestions, those who may desire to institute systematic measurements.

J. J. R. CROSS.
Chairman.

REPORT OF COMMITTEE ON UNIFORM ACCOUNTS AND RETURNS OF RAILROAD CORPORATIONS.

PRESENTED NOVEMBER 7, 1877.

The Committee appointed August 16th, 1876, on "Uniform Accounts and Returns of Railroad Companies," respectfully reports as follows:

On the day previous to the last annual meeting, the Committee had an interview with the gentlemen selected by the Commissioners of Massachusetts, to supervise the accounts and returns of railroad companies in the State of Massachusetts, at which several important suggestions were made, some of which were adopted by the Commissioners, and made a portion of their regulations. Your Committee have thought it best, before taking further steps in the matter, to await the result of the first years' operation of the system introduced by the Massachusetts Com-

missioners, and which has been adopted by the Commissioners of Connecticut, and of most of the other New England States.

It seemed to the Committee that if the result in those States was satisfactory, it would be far less difficult to secure the adoption of a similar system in the other States, and that on the contrary, if the system was found to need material modifications, such changes might be made as would make it acceptable before its adoption in the other States.

We therefore recommend that the Committee be continued.

Respectfully submitted,

WM. P. SHINN,
O. CHANUTE,
FRED. DE FUNIAC, } Committee.

REPORT OF COMMITTEE ON TESTS OF AMERICAN IRON AND STEEL.

PRESENTED NOVEMBER 7, 1877.

So full an account of the Board to test American metals, was recently given to the Society by Prof. R. H. Thurston, Secretary of the Board (see Proceedings, Vol. III, p. 26), that no further statement is needed to in-

form the Society fully of its history, work, and present status.

Your Committee deems it inexpedient to ask Congress, during its special session, for any appropriation of money for the uses of

the Board. And this conclusion has been reached after conference with its President. But the way should be thoroughly prepared for an application to be made during the next regular session of Congress for the repeal of the legislation terminating the existence of the Board when the money it now has is expended, and for the small appropriation that will be required to pay its current expenses. The expenditure of ten thousand dollars per annum, for three years, will enable the Board to bring up the knowledge of American metals even with the progress already made and to be made during that time, in their manufacture and use. The civil engineers, architects, mechanics, manufacturers and scientists of the United States have joined in asking Congress, through our Society, to institute and sustain a set of tests of American iron and steel. A Board has been organized to conduct such tests. Congress has appropriated, and the Board has expended, nearly one hundred thousand dollars. Elaborate and

very perfect preparations have been made for the tests and investigations proposed, and great hopes and expectations are entertained as to the benefits to be realized.

If we permit this effort to fail, all the work already done will be measurably lost. And when can it be undertaken again with so good a prospect of success? Discouraged by our failure, we will go on again for years groping for the knowledge which the Testing Board is organized to procure. These years being marked at short intervals with disastrous blunders of architects, engineers, builders and mechanics. On the other hand, if the Board is sustained, the knowledge obtained will be conducive to the great material interests of our people, and it will enable us to design and execute works creditable to ourselves and to American engineering.

Respectfully submitted,

WM. BOOT SMITH,

Chr. of Com. on Tests, &c.

MAYWOOD, Ill., Oct. 26th, 1877.

REPORT ON TIME AND PLACE OF TENTH ANNUAL CONVENTION.

PRESENTED NOVEMBER 7TH, 1877.

The Secretary, as Committee on Time and Place of the Tenth Annual Convention, has to report, that replies to circulars sent out have been received from 111 members.

Of these, as to time, 27 name June, 15 May, 7 July, 3 April, 2 February, 1 each January, March and September, and 54 express no choice; and as to place, 17 name San Francisco, 13 Boston, 10 New York, 4 each Chicago and Washington, 3 each Baltimore, Cincinnati, Cleveland and Niagara, 2 St. Louis, 1

each Bethlehem, Charleston, Paris and Providence, and 45 express no choice.

It will be seen, there is not a majority of votes in favor of either time or place named.

The Secretary has received letters from Messrs. Frederick Brooks and Joseph P. Davis, of Boston, relative to the Convention being held in that city, and these with this report, are respectfully submitted for such action as may now be deemed best.

G. LEVERICH, Committee.

REPORT OF THE COMMITTEE ON METRIC SYSTEM OF WEIGHTS AND MEASURES.

PRESENTED NOVEMBER 7TH, 1877.

G. LEVERICH, Esq.,

Sec'y Am. Soc. Civ. Eng's :

DEAR SIR,—The Committee on Metric System of Weights and Measures, respectfully ask leave to report at the next Annual Con-

vention. Will you please present this report at the Annual Meeting?

Truly yours,

CLEMENS HERSCHEL,

Chairman, for the Committee.

REPORT OF THE BOARD OF CENSORS FOR THE AWARD OF THE NORMAN MEDAL.

PRESENTED NOVEMBER 7TH, 1877.

At a meeting of the Censors designated by the Code of Rules for the award of the Norman Medal, held on the 27th October, 1877 : Present—George S. Greene, President of the Society ; F. A. P. Barnard, President of Columbia College ; J. G. Barnard, Corps of Engineers, U. S. Army ; two papers were received in competition for this medal.

The Norman Medal was awarded to the au-

thor of " Notes and Experiments on the Use and Testing of Portland Cement."

Books to the value of the medal not awarded last year, were awarded to the author of " On Igniting Blasts by means of Electricity."

GEORGE S. GREENE,

F. A. P. BARNARD.

J. G. BARNARD.

CENSORS.

REPORT OF THE COMMITTEE ON QUARTERS FOR THE SOCIETY.

PRESENTED NOVEMBER 7TH, 1877.

The Committee on Quarters for the Society, reports that the lease of the house now occupied by the Society will expire on May 1st, 1879. The Committee recommends that the Society should take measures to continue the discussion in respect to procuring a permanent home, either here or in some other convenient part of the city. The confusion and loss, and consequent interruption of the cur-

rent work of the Society, which has resulted from the recent necessary transfer from one house to another, have impressed the Committee more fully than ever with the great desirability of securing a place where there will be no probability of similar disturbance.

For the Committee,

JOHN BOGART,

Chairman.

REPORT OF THE COMMITTEE ON FINANCE.

PRESENTED NOVEMBER 7TH, 1877.

The Committee on Finance respectfully presents the following Report for the year ending November 6, 1877 :

Before referring to the expenditures properly belonging to the fiscal year ending November 6th, 1877, it is proper to state that a number of bills due prior to November 1st, 1876, were not presented till after that date, as follows :

Rent up to Nov. 1, 1876.....	\$400 00
Ledger, and for transferring the accounts of the administration of Treasurer Morse.....	75 00
Journal printing for August, 1876.....	214 75
“ “ “ Sept., “	113 00
“ “ “ Oct., “	162 50
Printing 1,000 Indexes to Proceedings.....	100 00
	<u>\$1,065 25</u>
Also an unsettled account of W. C. Bryant & Co. for printing, &c., done prior to Nov. 1, 1876—some of the items extending back to 1872.....	755 64
	<u>\$1,820 89</u>

This sum had to be paid during the present year.

The Treasurer's Report shows as follows :

RECEIPTS, &c.

Balance. Nov. 1, 1876.....	\$1,274 97
Entrance fees.....	1,010 00
Dues	7,427 96
Sales of Transactions and Diplomas.....	240 45
Fellowship subscription.....	150 00
Advertisements.....	492 25
Interest, Normal Medal Fund.....	70 00
“ Fellowship “	607 56
Miscellaneous.....	33 50
	<u>\$11,306 69</u>
Deduct (included above) two drafts deposited for collection, and not yet collected, \$30 and \$10.....	40 00
	<u>\$11,266 69</u>

PAYMENTS.

Rent.....	\$1,600 00
Janitor, heat, furniture, fitting rooms, moving, water, &c.	1,045 79
Library, purchases, catalogue.....	926 18
Transactions and Proceedings.....	2,766 19
Publishing Report on Technical Education.....	216 84
Insurance.....	55 80
Postage.....	500 35
Salaries.....	3,000 00
Stationery and Printing.....	325 97
Other expenditures.....	184 90
	<hr/>
	\$10,632 02
Balance on hand.....	634 67
	<hr/>
	\$11,266 69

We find, also, bills just presented or mentioned by the Secretary, yet unpaid, as follows :

One quarter's rent	\$400 00
Scudder & Curtis, legal services.....	160 88
Photo. Lith. Co.....	50 75
" "	4 25
Stationery, Ketchum.....	6 10
Water Rent.....	20 90
W. C. Bryant & Co., bill of printing, dating back to March, 1877.....	1,167 70
	<hr/>
	\$1,810 58

The amount of arrearages of members is very large.

Unless delinquent members shall soon pay up a considerable portion of back dues, the Society will be compelled to curtail its expenses in some way.

It will be noted that almost exactly the same amount of liability is carried from this to the next year as was brought to this year from the last.

It would not be proper to so exhaust our funds as to immediately pay this and also the current expenses as they become due ; but the appropriations, the liabilities, and especially the presentation of accounts, should in the future be so managed that gradually, and as soon as possible, bills should be paid soon after being incurred, and the income and outgo of each year be kept clearly and distinctly in proper adjustment.

Respectfully submitted,

W. MILNOR ROBERTS,
WILLIAM H. PAINE,
M. N. FORNEY.

REPORT OF TREASURER.

PRESENTED NOVEMBER 7TH, 1877.

Treasurer's Statement of Receipts and Disbursements for the Year.

RECEIPTS.

Balance, November 1, 1876.....	\$1,274 97
Entrance Fees.....	1,010 00
Dues.....	7,427 96
Sales of Transactions and Diplomas.....	240 45
Fellowship Subscription.....	150 00
Advertisements	492 25
Interest Norman Medal Fund.....	70 00
Do. Fellowship Fund.....	607 56
Miscellaneous.....	33 50
	<hr/>
	\$11,306 69
Deduct two drafts deposited for collection and not yet cashed.....	40 00
	<hr/>
	\$11,266 69

DISBURSEMENTS.

Rent.....	\$1,600 00
Janitor, Heat, Furniture, Fitting Rooms, Moving, Water, Ice and Gas..	1,045 79
Library, Purchases, Catalogue.....	926 18
Transactions and Proceedings.....	2,766 19
Publishing Report on Technical Education.....	216 84
Insurance.....	55 80
Postage.....	500 35
Salaries.....	3,000 00
Stationery and Printing.....	325 97
Other expenditures.....	194 90
	<hr/>
	\$10,632 02
Balance now on hand.....	634 67
	<hr/>
	\$11,266 69

JOHN BOGART, Treasurer.

MEMORIAL PROPOSED BY H. F. WALLING.

PRESENTED NOVEMBER 7TH, 1877.

To the Honorable the Senate and House of Representatives of the United States in Congress assembled :

The American Society of Civil Engineers respectfully represents to your honorable bodies that the triangulation of the United States Coast Survey, wherever it extends, affords a convenient and accurate basis for the locations of roads, railroads and public works of all kinds, as well as for topographical and other surveys ;—a basis which, for precision and completeness, is otherwise practically unattainable.

And the said Society, according their hearty approval of the United States laws whereby the Coast Survey Department is authorized to extend its triangulations over States where scientific Surveys are ordered by the State legislatures, respectfully petitions your honorable bodies to make the necessary appropriations for continuing such triangulations as may be called for under the said laws, whereby the valuable work of the Coast Survey may be more fully utilized, to the great advantage of all portions of the country.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Africa, a large Map of Tropical —. Commander Cameron, R. N., C. B. Showing the results of all recent explorations. London. *Daldy & Isbister.* (Announcement.)
 Algiers, Walks in—. L. G. Seguin. London. Crown 8vo, illus. and maps. *Daldy & Isbister.* (Announcement.)
 Amazon, Fifteen Thousand Miles on the — and its Tributaries. C. Barrington Brown, Assoc. R. S. M., and William Lidstone, C. E. London. *Stanford.* (Announcement.)
 Architecture, an Attempt to Discriminate the Styles of — in England, from the Conquest to the Reformation; with a Sketch of the Grecian and Roman Orders. By the late Thomas Rickman, F. S. A. Seventh —. The Albert Memorial, Hyde Park; Its History and Description. With numerous

illustrations on steel. James Dafforne, London. *Virtue & Co.* (Announcement.)
 —, American Cottage Homes. Palliser. New York. 4to, illus. *Bicknell & Co.* \$5.
 —, Cottages : How to Plan and Build them, to ensure Health, Economy and Comfort, with Hints on Fittings and Furniture. W. Herbert, London. *Bemrose & Sons.* (Announcement.)
 —, The Geometry and Optics of Ancient —. Illustrated by Examples from Thebes, Athens, and Rome. John Pennethorne. In folio, with 56 plates in Line and Colour. London. Folio. *Williams & Norgate.* (Announcement.)
 —, The Architectural History of the University and Colleges of Cambridge. By the late Professor Willis, M. A. With numerous

- Edition, with considerable additions, chiefly historical, by John Henry Parker, C. B., M. A., F. S. A., and numerous illustrations, London. *Parker & Co.* (Announcement.)
- Illustrations. Edited by John Willis Clark, M. A. London. *Cambridge Warehouse.* (Announcement.)
- , Manchester Town Hall: A series of Twenty Picturesque Photographs of the Exterior and Interior of the Building. J. McLeod. With Descriptive Letterpress, revised by the Architect. Manchester. *Heywood & Son.* (Announcement.)
- , Scottish Woodwork of the Sixteenth and Seventeenth Centuries. By J. W. Small. Edinburgh. *David Douglas.* (Announcement.)
- , a Manual of Naval —, for Officers of the Royal Navy, Mercantile Marine, Ship-owners and Shipbuilders. W. H. White, Assistant Constructor, Royal Navy. London. 8vo, illus. *John Murray.* (Announcement.)
- Art, Handbooks. (New Volume.) Bronzes. C. Drury E. Fortnum. New York. 12mo, illus. *Scribner, Welford & Armstrong.* \$1.
- , Lubke's History of —. Vol. 1. A New Translation from the Seventh German edition. Edited, with Notes, by Clarence Cook. New York. *Dodd, Mead & Co.* (Announcement.)
- , Contemporary — in Europe. S. G. W. Benjamin. New York. 8vo, illus. *Harpers.* \$3.60.
- , Persian —. Major R. Murdoch Smith, R. E. New Edition, with additional illustrations. London. *Chapman & Hall.* (Announcement.)
- , at Home Series. New Volumes. The Drawing Room. By Mrs. Orrin Smith. The Dining Room. By Mrs. Lottie. The Bed Room and Boudoir. By Lady Barker. London. *Macmillan & Co.* (Announcement.)
- Arctic Expedition, Shores of the Polar Sea: a Narrative of the — of 1875-76. Dr. Edward L. Moss, H. M. S. *Alert.* With sixteen large Chromo Lithographs and numerous Engravings, from Drawings made on the spot by the Author. London. *M. Ward & Co.* (Announcement.)
- , our Life in the Polar regions, or how we lived on the *Alert* during a voyage of discovery. Capt. Albert Hastings Markham, R. N. London. 8vo, illus. *Daldy, Isbister & Co.* (Announcement.)
- Australia, the Fifth Continent, with the adjacent Islands. Being an Account of —, Tasmania, and New Guinea, with Statistical Information to the latest date. Charles H. Eden. London. Crown 8vo, map. Society for *Prom. Christian Knowledge.* 5s.
- Brazil. Handbook of —. M. G. and E. T. Mulhall. Buenos Ayres. 12mo, illus. (*Stanford, London.*)
- Building Construction. Timber and Iron. R. Scott Burn, C. E. (Advanced Science Series.) London. *Collins.* (Announcement.)
- Cable Making and Suspension Bridges. With special references to the Cables of the East River Bridge. Wm. Hildenbrand. (Van Nostrand's Science Ser., No. 32.) New York. 16mo. *Van Nostrand.* \$0.50.
- Ceramics, The History of Ceramic Art in Great Britain, from the Earliest Period to the Present Day. Llewellyn Jewitt, F. S. A. With nearly 2000 Engravings. London. *Virtue & Co.* (Announcement.)
- Chemistry, Handbook of Volumetric Analysis. Edward Hart. New York. *Wiley & Sons.* \$2.50.
- , Outlines of Modern —. Organic. Based in part upon "Riché's Manuel de Chimie." C. G. Wheeler. Cincinnati. 12mo. *Jansen, McClurg & Co.* \$1.75.
- , Tables for Systematic Qualitative Chemical Analysis. 8vo. *Nashville (Tenn.)*
- , Combined Handbook and Note-book for Students of Inorganic Chemistry, preparing for the Examinations of the Science and Art Department (Elementary and Advanced). Oxford and Cambridge Local, and London University. James Monckman. Leeds. 12mo. (*Simpkins, London.*) 1s.
- Chimneys, Boiler and Factory —: their Draught Power and Stability; and on Lightning Conductors. Robert Wilson. London. *Lockwood, Crosby & Co.* (Announcement.)
- Cities and Cemeteries, The — — — of Etruria. George Dennis, H. B. M. Consul at Palermo. New Edition. Revised from Recent Visits to the Etruscan Sites, with a Chapter on Bologna. With 20 Plans and 150 illustrations. Two vols. London. 8vo. *John Murray.* (Announcement.)
- Cyprus, Its Ancient Cities, Tombs, and Temples. A Narrative of Researches and Excavations during ten years' residence in that Island. Louis P. di Cesnola. With maps and 260 illustrations. London. 8vo. *John Murray.* (Announcement.)
- Dock and Port Charges of the United Kingdom. With colored Maps of Ports and Rivers. London. 8vo. *C. Wilson.* 12s. 6d.
- Drainage, By-Laws and Regulations with reference to House —, adopted by the Uppingham Sanitary Authorities, and allowed by the Local Government Board. With Explanations and Suggestions by Rogers Field, M. Inst. C. E. London. 8vo, illus. *Spons.* 1s.
- House. Regulations to be observed on the Drainage and Water Supply of Town and Country Houses, as adopted by the Corporation of Nottingham and other Sanitary Authorities. With illustrations. By M. Ogle Tarbotton, M. Inst. C. E. London. 8vo, illus. *Spons.* 1s.
- Drawings, Patent Working —. By H. and T. C. Batchelor. These drawings, illustrating Mechanical Movements, are made upon a principle entirely new, the idea being to facilitate the study of the working of machines, by showing them in action on the drawing, and making the working parts describe, with the greatest precision and accuracy, the same paths and movements as they would do in the machine itself. London. *Macmillan & Co.* (Announcement.)
- Egypt, History of —, from the Earliest Period: derived from Monuments and Inscriptions. By Dr. Brugsch, of Göttingen. Translated by the late H. Danby Seymour, F.R.G.S. London. *J. Murray.* (Announcement.)
- Upper —, its People and its Products. A descriptive account of the Manners, Superstitions, Customs, and Occupations of the People of the Nile Valley, the Desert, and the Red Sea Coast, with sketches of the Natural History and Geology. Translated from the German of C. H. Klinzinger, M.D., formerly Egyptian Sanitary Physician at Koseir, on the Red Sea. With a Prefatory Notice by Dr. George Schweinfurth. London. 8vo, illus. *Blackie & Son.* 14s.

- Electricity and the Electric Telegraph.** George B. Prescott. London. 8vo, illus. *Spons.* 18s.
- , **The Student's Text-Book of —.** Henry M. Noad, Ph. D. New edition, revised and enlarged, with additions on Telegraphy by G. E. Preece, Esq. London. *Lockwood, Crosby & Co.*
- , **Compendium der Elektrischen Telegraphie.** With 169 cuts and 47 lithogr. plates. Wiesbaden. *L. Werdenbach.* 15s.
- , **The Application of — to Railway Working.** W. E. Langdon, Engineering Superintendent of Post-office Telegraphs. With numerous illustrations. London and New York. *Macmillan & Co.*
- Furniture, The History of —.** Researches and Notes on Objects of Art which form Articles of Furniture or would be interesting to collectors. By Albert Jacquemont. Translated from the French and Edited by Mrs. Bury Palliser. London. Imp. 8vo, 200 illus. *Chapman & Hall.* (Announcement.)
- Gas.** The — Consumer's Handy Book. William Richards, C.E. London. 18mo. *Spons.* 6d.
- , **A Practical Treatise on the Manufacture and Distribution of Coal —.** William Richards. With numerous wood engravings and large plates. London. Demy 4to. *Spons.* 28s.
- Geology of New Hampshire.** Prof. C. H. Hitchcock. Vol. 2. On Stratigraphical Geology. Illus. with heliotypes, maps, and charts. Concord, N. H. 4to, illus. *E. C. Eastman.* \$10.00.
- Geometry of Cycloids.** A Geometrical Investigation of the Principal Properties of the Cycloid, Epicycloid, Hypocycloid, Trochoids, and Associated Curves; to which is appended an Application of the Cycloid to determine, by Graphical construction, the Orbital Motion of Planets and Comets, and to Measure the range of Matter projected from the Sun. With numerous diagrams. By Richard A. Proctor, B.A., Cantab. London. *Longmans.* (Announcement.)
- Health.** Domestic Hygiene: A Guide to— and Healthy Homes. George Wilson, M.D. London. *Churchill & Co.* (Announcement.)
- , **A hand-book of Analysis of Water, Air, and Foods for the Medical Officer of —.** With Engravings. Cornelius B. Fox, M.A. London. *Churchill & Co.* (Announcement.)
- Heating.** A Manual of— and Ventilation in their practical applications, for the use of Engineers and Architects, embracing a series of Tables and Formulas for dimensions of Heating-Flow, and Return Pipes for Steam and Hot Water Boilers, Flues, etc., etc. F. Schumann. New York. 12mo, illus. *Van Nostrand.* \$1.50.
- , **Heat in relation to Steam and the Steam-Engine; an Elementary Treatise.** George Shawn. London. 8vo. *Macmillan & Co.* 4s 6d.
- , **The Analytical Theory of —.** Joseph Fourier. Translated, with Notes, by A. Freeman. London. *Cambridge Warehouse.* (Announcement.)
- Holland.** Through— or Towns and Customs of the Dutch. Charles W. Wood. London. demy 8vo, illus. *Bentley & Sons.* 12s.
- Iron and Steel Institute.** Journal of—. With 11 Plates. London. Demy, 8vo. *Spons.* New York. \$3.75.
- London, Old and New—**Vol. V., with about 200 illustrations and maps. London. *Cassell, Pether & Galpin.* 9s.
- , **Walks in—** Augustus J. C. Hare. With 100 illustrations by the author. 2 vols. London. Crown 8vo. *Daddy, Isbister & Co.* (Announcement.)
- Machine Construction.** E. Tomkins, Queen's College, Liverpool. (Advanced Science Series.) London. *Collins.* (Announcement.)
- Manures—on Artificial—** Their Chemical Selection and Scientific Applications to Agriculture. George Ville. Translated from the author's MSS., and edited by William Crookes, London. *Longmans.* (Announcement.)
- Mechanics—** A Manual of— of Engineering and of the Construction of Machines. Phil. Julius Weisbach. Vol. 2, Application of Mechanics to Machines. Trans. by A. Jay DuBois. New York. 8vo., illus. *Wiley & Sons.* \$5.00.
- Metallurgy: The art of extracting metals from their Ores, and adapting them to various purposes of manufacture.** Fifth Division. Silver. John Percy, M.D., F.R.S. London. *John Murray.* (Announcement.)
- Mining, Records of—** in Scotland. R. W. Cochran Patrick. Edinburgh. *David Douglas.* (Announcement.)
- Mines, Accidents in—**; their causes and prevention. Alan Bagot. London. *Paul & Co.* (Announcement.)
- Mont Blanc: A treatise on its geodesical and geological constitution—its transformations, and the old and modern states of its Glaciers.** Eugene Viollet-le-Duc, With 120 illustrations. Trans. by B. Bucknell. London. Demy 8vo. *Sampson, Low & Co.* 14s.
- Motion, Stability of a Given State of—** particularly Steady Motion. Adams' Prize Essay for 1876. E. J. Routh. London. 8vo. *Macmillan & Co.* 8s. 6d.
- Mycena, Ancient; Discoveries and Researches on the Sites of Mycena and Tiryns.** Dr. Schliemann, author of "Troy and its Remains." With Preface by the Right Hon. W. E. Gladstone, M.P. 500 Plans and illustrations. London. 8vo. *John Murray.* (Announcement.)
- Naturalist, The Home; with Practical Instructions for Collecting Arranging, and Preserving Natural Objects.** Chiefly designed to assist Amateurs. Harland Coultas. New York, 12mo, illus. *Scribner, Welford & Armstrong.* \$1.75.
- Obelisks: a Short History of the Egyptian —.** W. R. Cooper; with Translation of many of the Hieroglyphic Inscriptions, chiefly by Mr. Francis Chalas. London. Post 8vo. *Bagster.* 2s. 6d.
- Ocean, Thalassa; an Essay on the Depth, Temperature, and Currents of the —.** John James Wild, Member of the Civilian Scientific Staff of H. M. S. *Challenger.* With Charts and Diagrams by the author. London. *M. Ward & Co.*
- Ornament, Owen Jones' Grammar of —.** Illustrated by Examples from various Styles of Ornament. 112 Plates in gold and colors. New York. Imp. 4to. *R. Worthington.* \$20.00.
- Outlines; Reade's Second Grade Free Hand —.** Being a Series of 24 Graduated Designs adapted to the Practice of Pupils preparing for the Examinations of the Science and Art Department, and other Junior Art Students. London. Sq. 16mo. *Simpkin.* 2s. 6d.
- Penmanship, Compendium of Ornamental —.** D. T. Ames. With 46 Plates. New York. 4to. *Bicknell & Co.* \$5.00.

- Philosophy, Natural** —. For Beginners. I. Todhunter. Part II.—Sound, Light, and Heat. New York. 18mo. *Macmillan & Co.* (Announcement.)
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- Plate, Old English** —. Ecclesiastical, Decorative, and Domestic. Its makers and marks in London and Provincial Cities. Founded on papers and tables by Octavius S. Morgan. Wilfred J. Cripps. London. *John Murray*. (Announcement.)
- Prehistoric Europe; with Illustrations.** James Geike, of H. M. Geological Survey. London. *Daldy, Isbister & Co.* (Announcement.)
- Prices, Spon's Engineers' and Contractors' Illustrated Book of** —, of Machines, Tools, Ironwork, and Contractors' Material, for 1877-78. London. Royal 8vo. *Spons*. 7s. 6d.
- Pyramid, Our Inheritance in the Great** —. Prof. Piazzzi Smyth, Astronomer Royal for Scotland. 3d ed., rev. and enl. London. Post 8vo, illus. *Daldy, Isbister & Co.* 18s.
- **Facts and Fancies.** J. Bonwick. A Discussion of the various Theories, French as well as English, about the Great Pyramids. London. *Paul & Co.*
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Annual Report of Secretary of Internal Affairs,
State of Pennsylvania. Part IV. Railroad,
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Eighth Annual Report of the Bureau of Sta-
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setts.) Boston.

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ington.

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James Forrest, Secretary:

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Charles T. Hargrave.

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Stage at Birkenhead. Charles Graham
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The Rajpootna (State) Railway. Horace Bell.
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Transactions of the Institute for August, 1877.
Cooke's Ventilating Machine, Proceedings,
Ventilation of Mines. Newcastle-upon-
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From Portuguese Society of Civil En-
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Review of the Public Documents from the
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neers of Hanover, Hanover:

Journal of the Society. Edited by Professor
Keck. Published by the Directors. Vol.
XXIII. Part 4. 1877. Hanover.

From State Board of Geological Survey
of Michigan, Lansing, Mich.:

Geological Survey of Michigan, Lower Penin-
sula, 1873-1876, accompanied by a Geologi-
cal Map. Vol. III. Part 1, Geology; Part 2,
Paleontology, Corals. C. Rominger, State
Geologist. New York.

From Co. k Talcott, San Francisco:
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R. R. Lithograph. San Francisco.

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Report of Superintendent of the U. S. Coast
Survey, showing progress of Survey during
the year 1874. Washington, 1877.

From other sources:

Illustrations to accompany Annual Report of
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1869. Vol. IV. Washington, 1876.

Annual Report of the Commissioner of Pa-
tents for the year 1871. Vol. III. Illustra-
tions. Washington, 1876.

Catalogue of the University of Cincinnati for
academic year 1877-8. Cincinnati, 1877.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election.
BROWN, CHARLES O.....(Junior to Member), Eng. Passaic Rolling Mill Co., 138 Chambers street, New York	Nov. 7, 1877.
CLARKE, FREDERICK W.....Ch. Eng. S. Chicago Pumping Works, Chicago, Ill.....	" "
COMPTON, ALFRED G. [A.]...Prof. Applied Math. College of City of New York, New York	Sept. 5, "
JOHNSON, THOMAS H.....Civil Eng., 64 North High street, Columbus, Ohio.....	" "
RAYMOND, CHARLES W. [J.] Ass't Engineer, Department of Docks, New York.....	Nov. 7, "
WROTNOWSKI, ARTHUR F....Civil Eng., New Orleans, La.....	July 12, "

CHANGES AND CORRECTIONS.

ATKINSON, JOHN B.....	Sec. and Treas. St. Bernard Coal Co., Erlington, Ky.
BACON, JOHN W.....	Gen. Railroad Commissioner, State of Connecticut, Danbury, Conn.
BARNES, PHINEAS.....	Plainfield, N. J.
BAXTER, GEORGE S.....	Tarrytown, N. Y.
BLAND, JOHN C	265 South Fourth street, Philadelphia, Pa.
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BULLOCK, W. D.....	Box 262, Pawtucket, R. I.
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COLLINGWOOD, FRANCIS....	Ass't Eng. N. Y. & B. Bridge, cor. Cherry and Pearl streets, New York..
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DUN, JAMES.....	Ch. Eng. St. L. & S. F. R. R., North Springfield, Mo.
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- LEVERICH, G.....265 Macon street, Brooklyn, N. Y.
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N. Y.
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RESIGNED.

- DODGE, RICHARD D.....Brooklyn, N. Y.....Nov. 7, 1877.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III, December, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

NOVEMBER 21st, 1877.—The Society met at 8 P. M. The paper entitled "Notes and Experiments on the Use and Testing of Portland Cement," by W. W. Maclay, for which the Norman Medal was awarded, was read and discussed.

DECEMBER 5TH, 1877.—The meeting was held at 8 P. M. The diploma and bronze medal awarded to the Society by the authorities of the Centennial International Exhibition were presented.

A donation by Moncure Robinson, honorary member of the Society, was also presented, with an accompanying letter. The donation was a portfolio of the original drawings of the first construction of the Reading Railroad, with descriptive pamphlets. Vice-President Roberts, in presenting the letter of Mr. Robinson, made remarks in special reference to a locomotive spoken of in that letter; and the subject of early locomotives was discussed. The thanks of the Society were tendered to Mr. Moncure Robinson.

A paper by D. McN. Stauffer, member of the Society, describing a peculiar case of failure in a water main, was read and discussed.

It was determined that the Library of the Society should be opened on Thursday evenings, from 7½ to 10 P. M., during December, January, and February next, and that a record of members present on those evenings should be kept. The standing committees for the year were announced.

DECEMBER 19TH, 1877.—The meeting was held at 8 P. M. Donations of valuable books and documents, made to the Society by Mr. T. S. Sedgwick and by Mr. Edward A. Flint, were presented, and the thanks of the Society were directed to be tendered to each of the donors.

A paper by Charles Latimer, describing a graphic method of representing railroad accounts, was read, and an accompanying chart presented. Discussion on the subject followed.

The piece of pipe was exhibited containing the fracture referred to in the paper by D. McN. Stauffer, read at the last meeting, and discussion followed as to the probable cause of the fracture.

OF THE BOARD OF DIRECTION.

NOVEMBER 14TH, 1877.—The Board met, and the following Standing Committees were appointed :

On Finance : George S. Greene, William H. Paine and C. Vandervoort Smith.

On Library : W. Milnor Roberts, J. J. R. Croes, and Albert Fink.

Applications for membership were considered and other routine business transacted.

DECEMBER 5TH, 1877.—The Board met and considered applications for membership and other routine business.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Architecture, Interior.—E. Danbourg. London. Folio. *Chapman & Hall*. 52s. 6d.
- Early New England Interiors. Sketches in Salem, Marblehead, Portsmouth and Kittery. Arthur Little. Boston. Obl. folio. *A. Williams & Co.* \$6.00.
- Historic Mansions and Buildings of Philadelphia, with some notices of their Owners and Occupants. Thompson Westcott. Philadelphia. 4to. *Porter & Coates*. \$5.00.
- The Stately Homes of England. L. Jewitt and S. C. Hall. 2d Series. Philadelphia. Square 8vo. *Gebbie & Barrie*. \$7.50.
- Bicknell, Series on—. A. J. Bicknell. New York. 4to. *A. J. Bicknell & Co.*
- Cottage and Villa Architecture. \$6.00.
- Street, Store and Bank Fronts. \$4.00.
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- School House and Church Architecture. \$3.00.
- Stables, Out Buildings, Fences and Miscellaneous Details. \$2.50.
- Rudiments of the Art of Building. E. Dodson. 10th ed. (Weale's Series). London. 12mo. *Lockwood*. 2s.
- Education applied to Industry. George Ward Nichols. New York. 8vo, illus. *Harpers*. \$4.00.
- Flaxman's Outline Designs. Used in the Greek and other schools of Decorative—First Series of 20 designs. In a portfolio. Boston. *Tilton & Co.* \$1.00.
- Studies in Ornamental—, as applied to the Decoration of Pottery. First Series. Part I.—Greek Ornament. Boston. *Tilton & Co.* \$1.00.
- The House Beautiful. Essays on Beds, Tables, Stools and Candlesticks. Clarence Cook. New York. 4to, illus. *Scribner, Armstrong & Co.* \$7.50.
- Astronomy, Annals of the Astronomical Observatory of Harvard College. Vol. VIII. Results of Observations made or directed by William Cranch Bond, A.M., George Phillips Bond, A.M., and Joseph Winlock, A.M. Part I. Historical Account of the Observatory from October, 1855, to October, 1876. Part II. Astronomical Engravings of the Moon, Planets, &c. Astronomical Engravings illustrating Solar Phenomena. 51 plates. Boston. 4to, illus. *Ginn & Heath*. \$10.00.

- Builder, The Immigrant**—: showing how to place and construct dwellings in the bush, on the prairie, or elsewhere, cheaply and well, with wood, earth, or gravel. C. P. Dwyer. Philadelphia. 8vo, illus. *Claxton, Remsen & Harffelfinger*. \$1.50.
- Cement, Science and Art of the Manufacture of Portland**—, with Observations on some of its Constructive Applications. H. Reid. London. 8vo. *Spons*. 18a.
- Centennial Exhibition, Gems of the**—, Consist. of Illus. descriptions of Objects of an Artistic Character in the Exhibits of the U. S., Great Britain, France, Spain, Italy, Germany, Belgium, Norway, Sweden, Denmark, Hungary, Russia, &c. New York. 4to, illus. *Appletons*. \$6.00.
- **Photographic Souvenir of the**—
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- **Treasures of Art, Industry, and Manufacture**, as represented at the —, 1876. C. B. Norton. 40 plates, with letterpress in English and French. Large folio, half turkey, full gilt. Philadelphia. *S. T. Souder*. \$50.00.
- Cyprus; Its Ancient Cities, Tombs, and Temples**. A Narrative of Researches and Excavations during Ten Years Residence in that Island. Gen. L. P. di Cesnola. New York. 8vo. Maps and illus. *Harpers*. \$7.50.
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- Metric System. Easy Steps in the**— for Elementary Subjects. With Answers. G. Gill. London. 18mo. *Kempster*. 2d.
- Microscope. The**— Andrew Ross. New York. 12mo. *Industrial Pub. Co.* \$0.75.
- Mycenæ. A Narrative of Researches and Discoveries at**— and Tiryns. By Dr. Henry Schliemann. With a Preface by the Right Hon. W. E. Gladstone, M. P. With plans, views, and cuts, representing more than 700 types of the objects found in the Royal Sepulchres of Mycenæ, and elsewhere in the excavations. New York. 4to, illus. *Scribner, Armstrong & Co.* \$12.00.
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- Canada; an Essay, J. Sheridan Hogan. Montreal, 1855.
- Report of the Southern R. R. of Canada. William Scott, C. E. 1855.
- Great Southern Railroad, Canada. Letter to Railway Committee, R. G. Bennett, Chief Engineer. 1855.
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 Modern War. Its theory and practice.

ANNOUNCEMENTS.

THE ATTENTION OF MEMBERS IS EXPRESSLY called to the following resolution, passed after the reading of the paper published in the present number of Transactions.

Whereas, It has appeared in the discussion of the paper on cements, contributed by W. W. MacLay, that other members of the Society have data bearing on this subject, which is valuable and interesting, but which they may deem hardly extensive enough to form the subject of separate papers, and whereas, there is, doubtless, a large amount of such information in the possession of individual members of the Society ;

Therefore Resolved, That the members of the Society be requested to communicate to the Secretary any unpublished information they may have on the subject of cements which they are willing to make public, the same to be edited by the Secretary and published by him in a single paper.

IN TRANSMITTING LETTER BALLOTS members of the Society are requested to conform in all respects with the printed regulations issued with the ballots. These regulations are frequently not complied with. Ballots are received without the signature of the member on the outer envelope, with initials instead of full signature or with other irregularities. When laid before the Society such irregular ballots have been thrown out and members sending them have lost their votes. The regulations seem to be as simple as possible to secure a fair secret ballot.

ILLUSTRATIONS OF PAPERS presented for publication should be distinctly drawn in *broad, sharp lines*, upon *white, smooth* (not "egg" or enamelled) paper, with perfectly *not glossy, or gray* black ink, to a scale twice or thrice greater than the print is to be: which in no case should require folding in more than one direction (*i. e.*, the depth of plate, as inserted in Transactions, should not exceed 7 inches). Shades are to be produced by variations in size and spacing of black lines; no brush work or colors are admissible. Unless figures and letters can be *well* put in, simply pencil them, leaving the engraver to insert them on the plate. Always put a lineal scale upon each drawing.

MEMBERS OF THE SOCIETY are requested to contribute papers on Engineering subjects, giving results of practice, or discussing pertinent theoretical questions ; their comments upon papers published in Transactions are solicited, and they are urged to contribute from note-books and other records whatever may bear upon the subjects considered, or upon other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, vol. 1.

DONATIONS TO THE LIBRARY.—Members and others are asked to contribute regularly to the library of the Society, copies of government, municipal, railway, canal and other reports, specifications, profiles, maps, photographs and like matter, making up the record of engineering operations for the past or present, and to inform the Secretary where such may be had. Duplicate copies are desired, for transmission to foreign societies in return for works collected and sent to this library by them ; also for exchange with members and others who wish complete sets referring to particular subjects. Donations of old or new reports or pamphlets which refer to or illustrate Engineering constructions or operations are particularly solicited. Many of these may be really of great importance as a part of the Library, and as possibly containing information which might not otherwise be preserved.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. They are open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when they are closed at 3 o'clock P. M.

The Library and Conversation Room will also, for the present be open every *Thursday evening*, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

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PROCEEDINGS

OF THE

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OF

CIVIL ENGINEERS.

(INSTITUTED 1852.)

VOL. IV.

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 - May 13th, 1878, Arrangements for Convention made; committee report transmitted, 58.
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 - January 16th, 1878, "Igniting Blasts by means of Electricity," by JULIUS H. STRIEDINGER, read, 4.
 - February 6th, 1878, Secretary reports assignment of space at Paris Exposition; committee reports selection of commissioner and resolutions in reference to preparation of Exhibit; T. E. SICKELS chosen Commissioner at Paris; GEORGE S. MORISON, EDWARD P. NORTH, JOHN BOGART appointed committee to prepare Ex-

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- hibit, 4; resolution to indefinitely postpone further consideration of Metric System adopted; other ballots referred, 5.
- February 20th, 1878, Death of JOHN F. TRACY, Fellow A. S. C. E. announced and committee appointed to prepare memoir; committee on Paris Exhibit made report; Board of Direction made report; candidates declared elected; ballot upon adoption of a memorial to be again taken, 5.
- March 6th, 1878, Ballot upon amendment to By-Laws canvassed and amendment adopted; "Improvement of South Boston Flats," by EDWARD S. PHILBRICK read, 15.
- March 20th, 1878, "On a new Method of detecting overstrain in Iron and other Materials," by R. H. THURSTON read 15.
- April 3d, 1878, Thursday evenings attendance reported; committee on Paris Exhibit reports; memorial as to Triangulations of Coast Survey adopted, 31; ballots for membership canvassed; "The law of Tidal Currents in river harbors," by J. H. STRIEDINGER read; account of Hooghly Floating Bridge read, 22.
- April 17, 1878, "Incline Plane Railroad, at Madison, Ind.," by M. J. BECKER read; Edison Phonograph Exhibited, 22.
- May 1st, 1878, Committee on Paris Exhibit reports; ballots for membership canvassed; Reminiscences and Experiences of Early Engineering Operations on Railroads, with special reference to steep inclines, by W. MILNOR ROBERTS read, 37.
- May 15th, 1878, "On the Theoretical Resistance of Railroad Curves," by SAMUEL WHINERY read, 37.
- June 5th, 1878, Ballots for membership canvassed, 37; secretary reported arrangements for Convention; amendments to Constitution and By-Laws offered; discussion on "Resistances on Railway Curves" continued, 38.
- June 19th, 1878, Business meeting at Convention; amendment to Constitution discussed; amendment to By-Laws discussed and withdrawn; committee appointed on method of election of officers, 38.
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- August 7th, 1878, Ballots for membership canvassed; resolution for appointment of committee on economy in use of steam referred to Board of Direction; death of C. RIDGELY SCHOTT announced and committee to prepare memoir appointed, 81.
 - August 21st, 1878, An addition to paper "Observations on the stresses developed in metallic bars by applied forces," by THEODORE COOPER read, 81.
 - September 4th, 1878, Ballots for membership canvassed; "Fall of the Western Arched Approach to South street Bridge, Philadelphia," by D. MC N. STAUFFER read, 89.
 - September 1878, The subject of Asphalt pavement discussed, 89.
 - October 2d, 1878, ballots for membership canvassed; ballot upon resolution to appoint committee as to maximum economy in the use of steam canvassed; report of Board of Direction with proposed codification of Constitution and By-laws presented; amendments to Constitution and By-Laws presented, 90; paper upon tests of hydraulic cements and of bricks, by FRANCIS COLLINGWOOD read, 91.
 - October 16th, 1878, "The Flow of Water, illustrated by Kutter's Diagram," by R. HERING read, 91.
 - November 20th, 1878, "Submarine Telephoning," by CHARLES W. RAYMOND read; "The Permanent Way of Railways in Great Britain and Ireland, with especial reference to the use of timber preserved and unpreserved," by JOHN BOGART read, 131.
 - December 4th, 1878, Ballots for membership canvassed; "The use of Compressed air in Tubular Foundations, and its application at South street Bridge, Philadelphia," by D. MC N. STAUFFER read, 131.
 - December 18th, 1878, Portions of the Report of Committee on Resistances of Trains with reference to the evaporative efficiency of Locomotives read, 132.
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV, January, 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 2D, 1878.—The Society met at 8 P. M., Vice-President Roberts in the chair. The Norman Medal was presented to William W. MacLay, and the Norman Prize of Books was presented to Julius H. Striedinger.

The following amendment to the By-Laws was moved by Mr. John Bogart, and seconded by Messrs. G. Leverich and George S. Greene, Jr.

By-Laws, Section 23, Sub-section 5, strike out the clause in brackets following this Sub-section, and leave the Sub-section so as to read as follows :

5th. A Junior shall be one who has had actual practice in some of the branches of civil, military, mining, or mechanical engineering, for not less than two years ; or if a graduate of a scientific or collegiate institution, for not less than one year.

Under the rule this will be voted upon by letter-ballot.

The following resolution was passed :

Resolved, That the Secretary of the Society be requested to address a circular to the members of the Society, asking voluntary contributions for exhibition at the Paris Exposition, and inviting subscriptions of money to enable the Society to make a proper exhibition ; and that he be requested to secure the necessary space for the use of this Society.

The following resolution was also passed :

Resolved. That a committee of three be appointed by the Chair to select some member of the Society to serve as sole Commissioner of the Society at the Paris Exposition—such selection to be reported for action at the next regular meeting of the Society.

Under this resolution, the following committee was appointed: Messrs. George S. Morison, Albert Fink, and John Bogart.

The result of the ballots on amendments to the Constitution and By-Laws was then declared as follows :

On the following amendment to the Constitution—

ARTICLE XIX.—For “two” insert “five” and for “thirty” insert “twenty-five”. The article will then read :

All candidates for admission to the Society must file statements, by themselves, setting forth the grounds of their claim to be elected ; be proposed by at least five members of the Society, to whom they must be personally known, and a notification of the same sent to each member whose address is on record. Each proposition, with the names of the proposers, must be posted in some conspicuous place in the rooms of the Society for at least twenty-five days before being submitted to vote. All papers and applications shall be laid before the Board of Direction, and be reported upon previous to action by the Society.

There were 112 yeas, 8 nays, and no blanks. This amendment was declared adopted.

On the following amendment to the Constitution—

ARTICLE XX.—For “thirty” insert “twenty-five,” and for last clause insert as below. The article will then read :

In elections for membership, of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after twenty-five days have elapsed from the time of mailing the notification. Negative ballots exceeding five per cent. of the total number canvassed shall exclude.

There were 20 yeas, 97 nays, and 3 blanks. This amendment was declared lost.

On the following amendment to the Constitution—

ARTICLE XX.—In elections for membership of either class, members shall vote by letter or by ballot, in the usual way, and the result shall be announced at the next regular meeting held after thirty days have elapsed from the time of mailing the notification. Five or more ballots cast in the negative shall exclude. Members notified, but not responding, shall be classed as voting in the affirmative.

There were 92 yeas, 26 nays, and 2 blanks. This amendment was declared adopted.

On the following amendment to the Constitution—

ARTICLE XX.—For “three” insert “ten ;” the Article otherwise will read as the preceding.

There were 9 yeas, 100 nays, and 11 blanks. This amendment was declared lost.

On the following amendment to the Constitution—

ARTICLE — (A new Article)—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, or who from ill health, advanced age, or other good reason assigned, has a scanty income ; and the board may remit the whole or part of assessments in arrears, or accept, in lieu thereof, desirable additions to the Library and Museum.

There were 41 yeas, 76 nays, and 3 blanks. This amendment was declared lost.

On the following amendment to the Constitution—

ARTICLE — (A new Article)—Upon the written request of ten or more members that for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and, if there be sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him and present a written defense. Two months after such advice was given, the Board of

Direction shall finally consider the case, and, if resignation has not been tendered, or a satisfactory defense made, may then expel the accused. Such action shall be stated to him and the Society, and this shall be, in any event, the only public announcement of the matter.

There were 11 yeas, 103 nays, and 6 blanks. This amendment was declared lost.

On the following amendment to the Constitution—

ARTICLE —(A new Article.) Upon the written request of ten or more members, that for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given, the Board of Direction shall finally consider the case, and if resignation has not been tendered or a satisfactory defence made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall, in any event, be the only public announcement of the matter.

There were 98 yeas, 19 nays, and 3 blanks. This amendment was declared adopted.

On the following amendment to the Constitution—

ARTICLE XXII.—(To read.) Persons thus elected and duly qualified, who reside within fifty miles of the post office in the City of New York, shall be deemed Resident; and those who reside beyond this limit shall be deemed Non-Resident. The membership of any person shall begin on the day of his election.

There were 111 yeas, 4 nays, and 5 blanks. This amendment was declared adopted.

On the following amendment to the Constitution—

ARTICLE XXIX.—(To read.) Members, who become Residents or Non-Residents by removal into or beyond the limits prescribed in Article XXII., shall be subject to assessments in the class in which they were on the day of the annual meeting, as may appear upon the records of the Society, or by written notice to the Secretary.

There were 114 yeas, 2 nays, and 4 blanks. This amendment was declared adopted.

On the following amendment to the Constitution—

ARTICLE —. (A new Article.) Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

There were 115 yeas, 4 nays, and 1 blank. This amendment was declared adopted.

On the following amendment to the By-Laws—

SECTION 30. (To read :)—Special committees to report upon engineering subjects, shall be authorized only by a majority of the votes cast by the Society, and in the following manner: Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument against the appointment of such committee. The mover of the resolution under consideration shall be invited to present the arguments for the same, under a limit of occupying no more than one-half page of the printed proceedings in their presentation; the same limit to obtain, also, in the case of the argument against; said invitation shall be extended to the mover, at least one month before the argument is needed to go upon the letter ballot, and if not furnished by that time, no argument for the resolution shall be presented. The statements of argument shall be printed, and issued to the Society with letter ballot; or, if the Board fails to report within one month, the letter ballot shall be issued without comment; or, the Society may vote

by ballot at the Annual Meeting, or in Annual Convention, upon such resolution within one month after it has been submitted to the Board of Direction. No mover of a resolution shall serve in the presentation of arguments *against* a resolution under this Law, while the resolution offered by him is pending a vote of the Society.

There were 77 yeas, 29 nays, and 14 blanks.

Upon the announcement of this ballot, the presiding officer decided that the 14 blank ballots ought not to be counted as part of the vote, and that the vote stood 77 yeas and 29 nays. An appeal was taken from this decision, and by vote the decision was reversed. This amendment was then declared lost.

JANUARY 16TH, 1878.—The Society met, Mr. Geo. S. Greene in the Chair. A paper entitled, "On Igniting Blasts by means of Electricity," by Julius H. Striedinger, was read.

FEBRUARY 6TH, 1878.—The Society met, Vice-President Roberts in the Chair. The Secretary, Mr. John Bogart, reported issue of circulars in reference to the Paris Exhibition, and also that on his application as directed by resolution of January 2d, a fair space in a good location had been assigned the Society by the Commissioner General of the United States for the Paris Exposition.

Mr. Geo. S. Morison, Chairman, presented the report of the Committee appointed January 2d, as follows :

The committee appointed to select a Commissioner to represent this Society at the Paris Exposition of 1878, begs leave to report :

That they have selected Mr. T. E. Sickels, as a gentleman eminently suitable for the position, and recommend that he be appointed Commissioner.

The Committee have had under consideration two possible classes of commissioners,

1st. A young man who would give his whole time to the care of the exhibit.

2d. An Engineer who could serve as representative of the Society, be able to introduce its members to foreign Engineers and secure means of access to foreign works, leaving details of the care of the exhibits to an assistant of his own selection.

The latter class has been preferred by the Committee, and therefore Mr. T. E. Sickels, who has exceptional advantages, is on intimate terms with the Commissioner General, and who expects to be in Paris during the continuance of the Exposition, has been selected.

The Committee also suggest the following resolution :

That a committee of three be appointed by the Chair to co-operate with the Commissioner in preparing a suitable exhibition on the part of the Society, such committee to be authorized to obtain for the purpose, by loan or gift, such drawings, models, photographs and other objects as shall, in their opinion, form a representative collection of American Engineering works ; also to have the direction of the expenditure of the funds voluntarily contributed for these purposes.

The report of the Committee was accepted, its recommendations adopted and Mr. T. E. SICKELS was chosen as Commissioner to represent the Society at the Paris Exposition.

The resolution as recommended, was adopted, and the following Committee was appointed in accordance therewith :

GEO. S. MORISON,
EDWARD P. NORTH,
JOHN BOGART,

The tellers reported that upon the ballot upon the following resolution

Resolved, That the further consideration of the metric system of weights and measures be indefinitely postponed,

There were 102 Ayes and 57 Noes. This resolution was declared adopted.

Upon the ballot on the question of adoption of the memorial in reference to the extension of the triangulations of the coast survey, and also upon the ballot for admission of new members, questions of order were raised and these ballots were referred to the Board of Direction. The Society adjourned to February 20th, at 8 p. m.

FEBRUARY 20TH, 1878.—A meeting of the Society adjourned from February 6th, was held at 8 p. m., Mr. R. H. Thurston in the Chair. The death, on February 13th, of Mr. John F. Tracy, Fellow of the Society, was announced by the Secretary, and W. Milnor Roberts and Milton Courtwright were appointed a committee to prepare a memoir of the deceased.

The Committee on Exhibit at Paris reported that arrangements had been made for constructing a structure to be set in the Exposition building, so as to obtain ample wall space. Also that estimates of the necessary expenses of the Exhibit had been made and a circular letter prepared which was presented and read. The action of the Committee was approved.

The action of the Board of Direction upon the questions referred to it at meeting of Society of February 6th, was reported as follows :

1st. That the candidates voted for on ballot of February 6th, 1878, were duly elected, as follows : As members—C. Frank Allen ; C. G. Force, Jr. ; Charles P. Gilbert ; Edward Marsland ; James C Post. As Juniors—Ira E. Clark ; Norman B. Kellogg ; Edward Prince.

2d. That as among the ballots cast upon the adoption of the memorial in reference to the triangulations of the Coast Survey, there were some admitted from members in arrears for more than one year's annual dues, and as the vote upon this question was within one of a tie vote, therefore the question of the adoption of that memorial should be again submitted to the Society.

OF THE BOARD OF DIRECTION.

JANUARY 2D, 1878.—The Board met and determined that an abstract of the discussion in reference to the metric system at the annual meeting and of letters since received upon that subject, should be prepared by the Secretary and sent out with the letter ballot upon the resolution indefinitely postponing the further consideration of the metric system. It was also determined that arguments should be prepared by a

committee and submitted with the letter ballot upon the adoption of the proposed memorial in reference to the extension of the triangulations of the United States Coast Survey. Applications for membership were considered.

JANUARY 16TH, 1878.—Applications for membership were considered.

FEBRUARY 6TH, 1878.—Applications for membership were considered.

FEBRUARY 18TH, 1878.—Applications for membership were considered. The subject of the ballots referred to the Board by the Society, February 6th, was considered, and action taken as follows: 1st. That all the candidates for membership on the ballot list voted for February 6th, 1878, were elected. 2d. That as among the ballots cast upon the adoption of the memorial in reference to the triangulations of the coast survey, there were some admitted from members in arrears for more than one year's annual dues, and as the vote upon this question was within one of a tie vote, therefore the question of the adoption of that memorial should be again submitted to the Society.

NOTES AND MEMORANDA.

EXPOSITION AT PARIS, 1878.

The following circular letter was prepared by the Committee on the Exhibit of the Society at Paris, and approved at the meeting of Society, February 20th, 1878:—

February 25th, 1878.

DEAR SIR.—At the meeting of the Society, Jan. 2d, 1878, it was determined to take action towards securing for the Paris Exposition an exhibit of Engineering in the United States. The secretary was directed to secure space, and a committee was appointed to suggest a commissioner to represent the Society. The committee found that a well known member of the Society, Mr. T. E. Sickels, intended to be in Paris during the Exposition, and had already been requested by the United States Commissioner-General to assist in having engineering well represented. The advantages of having, as the representative of the Society, an engineer of standing who would also be in close relations with the authorities at Paris, were apparent, and at the meeting of Feb. 6th Mr. Sickels was appointed Commissioner to represent the Society. The undersigned were appointed a committee to assist in securing a good exhibit, and to arrange in reference to the funds requisite to ensure success.

The space secured for the exhibit is 21 feet long and 16 feet wide, at the junction of two main aisles, with passage-way on all sides and the use of the wall surfaces back of this space. Upon this the committee purpose erecting a frame-work structure, so as to obtain all possible wall area, and to have a floor above for models, plans in portfolio, albums, &c. The divisions of the structure will be assigned to various departments, so that bridge superstructures, foundations, rolling stock, manufacture of steel and iron, hydraulic and steam machinery, pumping engines, turbines, improvement of rivers and harbors, inland navigation, canals, and if drawings are obtained, other branches of engineering may be intelligently represented in separate departments. Drawings of characteristic works actually constructed will be exhibited upon the walls, and additional drawings and photographs collected in portfolios. Some models will also be secured.

The committee has endeavored to keep the estimate of expenditures very low. The Commissioner serves without compensation. The structure will be framed here at small cost. We are assured of all possible facilities from

the Commissioner-General, who is personally anxious for the success of the exhibit. An attendant will be required, but it is thought that one may be found in Paris at moderate cost. It is believed that the entire expense can be brought within \$1500. It is desirable that the amount subscribed should exceed this expense, so as to provide for printing and distributing to our members such information as may be collected at Paris. This committee is directed by the Society to appeal to its

members for the requisite subscription. Business is not such as to warrant an expectation of many large subscriptions. But a number of moderate subscriptions, added to the larger ones of those members who can afford to make them, will assure success.

Will you kindly notify the committee if you can subscribe, and whether you have any plans or models you desire to exhibit?

GEO. S. MORISON,
EDWARD P. NORTH, } Committee.
JOHN BOGART,

METRIC SYSTEM OF WEIGHTS AND MEASURES.

In submitting to vote of the Society the following resolution, offered at the annual meeting. "Resolved, that the further consideration of the metric system of weights and measures be indefinitely postponed," the Board of Direction issued with the ballot the following abstract and letter:—

Abstract of the discussion at annual meeting, Nov. 7, 1877, following the presentation of the report of the Committee on Metric System of Weights and Measures.

The report of the committee was as follows:

G. LEVERICH, Esq., *Secretary American Society of Civil Engineers:*

DEAR SIR.—The Committee on Metric System of Weights and Measures respectfully ask leave to report at the next annual convention. Will you please present this report at the annual meeting?

Yours truly,

CLEMENS HERSCHKE,
Chairman for the Committee.

A member desired to know what duties were yet unperformed by this committee. It was appointed to prepare a memorial to present to Congress; it did prepare a memorial which was submitted to the Society and voted down; it is not to be supposed that the same memorial will be presented again at the next Convention.

Another member said that, as the form of memorial submitted by the committee had not been adopted, it was the duty of the committee to present another form of memorial. The rejection of the memorial was only, that its form was not satisfactory, but is no reflection on the diligence of the committee.

A motion that the committee be continued was lost.

It was then moved that another committee be appointed to carry out the wishes of the Society in framing a memorial to Congress on the adoption of a Metric System of Weights and Measures, in accordance with the provisions of the resolution adopted by this Society in appointing the former committee.

It was then suggested that if a committee be appointed for any such purpose, those members of the Society who are not in favor of a metrical system have an equal representation with those who are in favor of it.

A member said that there seemed to be a disposition among certain members to enforce one particular system upon the Society. He did not believe that the large majority of the Society would ever use the metric system. The Society voted to appoint the committee, with only one side of the argument presented to it. The papers in opposition to the metric system were not published until after the ballots were sent out. Two members of the committee withdrew because they were in a minority, and they did not wish to be represented on it. Afterwards there was a vote which showed it was not at all the sentiment of the Society that the metric system should be adopted. The Society voted as a matter of course for the appointment of a committee, but the Society voted against the resolution presented by that committee.

It was then moved that everything relating to the metric system or any other system of weights and measures be indefinitely postponed.

A member then said that, at the Convention of 1876 the following resolution was referred to the Board of Direction (Proc., vol. II, p. 85):

"Resolved, That the American Society of Civil Engineers will further by all legitimate means the adoption of the metric standards in the Office of Weights and Measures at Washington, as the sole authorized standard of weights and measures in the United States; that the Chair appoint a committee of five to report to the Society a form of memorial to Congress in furtherance of the object expressed; and that the foregoing be submitted to the Society and voted on by letter ballot."

On December 6th, 1876 (Proc. vol. II, p. 173), this resolution was directed to be submitted to letter ballot without comment. On Feb-

ruary 7th, 1877 (Proc., vol. iii, p. 7), the letter ballot was canvassed with the result of 138 ayes, 73 nays, and 20 blank. At the Convention of 1877 (Proc., vol. iii, pp. 47, 48, 52), the committee appointed under this resolution reported a form of memorial. That form of memorial was submitted to letter ballot and the ballot canvassed October 3d, 1877. This vote was not on the question whether a memorial should be presented at all but on the adoption of the form of memorial as presented by the committee. The statement of the argument against it, is printed in Proceedings for September, 1877 (vol. iii, p. 88). The most objectionable part of the memorial was as follows;

"The prayer of your memorialist, therefore, is that your honorable body may enact, that in every publication, report, advertisement and other official document issued by the Government, *only* the metric system of weights and measures shall be used on and after such date as your honorable body may deem the most advisable."

The ground taken was, that this was not what the committee was authorized to do, and the result of the ballot upon the adoption of this memorial was (Proc. vol. iii, p. 88), 18 ayes, 96 nays, and 5 blanks. This vote did not dissolve the committee; it merely expressed a disapproval of what they had submitted. It is the duty of the committee to present another form of memorial.

Another member said that, considering the question a very serious one, he thought that a more general expression of the views of the Society should be obtained than would be possible by a vote at this meeting. While it may be competent for action to be taken now, it would be wise to give all voting members of the Society an opportunity to express themselves upon it.

Another member said it seemed only a matter of fair play. The original resolution was sent out without comment, and before a number of papers discussing the matter had been published. Possibly, if the whole matter was again submitted to the Society the vote might be reversed. But the Society did, by a large majority, vote for the appointment of a committee, and no final action ought to be taken, except by the whole Society.

Another member said that, at the Convention of 1876, the subject was sent to the Board of Direction and to letter ballot, not by a vote of the Convention, but under the By-laws. No vote was taken at the Convention upon that subject. The mover of the resolution

was allowed thirty minutes to advocate it: only one member was allowed to speak in opposition. The Society never voted approval of this system. The vote was only upon the appointment of a committee; that committee made a report, and that report was most emphatically voted down. A motion to continue the committee has to-day been lost. Another resolution was proposed at the Convention of 1877 (Proc. vol. iii, p. 48), for the appointment of a committee to consider and report upon what is the best system of weights and measures for the use of engineers in the United States. This member also said that while he considered the metric better than our present system, he was not assured that it was the best system. The Chairman of the Committee says he does not use it in his own office. Its use is principally by schoolmen and professors. It is based upon a wrong principle; the unit is too long. Nothing like our ten feet and hundred feet measures can be used. A better system can be devised. The Society ought not to commit itself to an imperfect system.

It was then ordered that the resolution be submitted to the Society for letter ballot.

The following letter from a member of the committee, is also presented:

"It seems to me that the proposed action would leave the Society in a worse position than it now occupies. It is now committed, by a standing notice printed in Proceedings, to the policy of writing in papers presented hereafter, 'weights and dimensions by the metric system, in connection with those of the system in general use' (Proc. vol. iii, p. 52). If we should never take another step, either forward or backward, this would be a nuisance. It is the policy of civilized nations to establish one system of weights and measures, and to prohibit the use of others. The United States, having two discordant standards now legal, has to decide which one it will ultimately use, and which abolish. In reply to a resolution of inquiry recently passed by the House of Representatives, the Heads of the Executive Departments have made reports as to the practicability of adopting the metric system exclusively and the time which should be allowed for its introduction; and it is publicly stated that the House Committee on Coinage, Weights and Measures will soon report a bill making the metric system obligatory in all governmental transactions. I think it eminently proper that the American Society of Civil Engineers should have an opinion on the question. The leading arguments on both sides have been presented in the debates we have already had, but there are those among us who might learn something from further discussion. The subject is of momentous importance, and the Society will make itself ridiculous if it undertakes to treat it with contempt."

PROPOSED MEMORIAL.

In submitting to vote the proposed memorial in relation to the extension of the triangulations of the United States Coast Survey (see Proceedings, November, 1877, vol. III., page 127), the Board of Direction issued with the ballot the following arguments:—

ARGUMENT FOR ADOPTION.

The extensive and valuable work of the coast survey loses much of its practical utility unless its triangulations are made available in the manner provided for by previous Acts of Congress, and it is very poor economy to waste so much valuable and expensive work by failing to make the comparatively small appropriation needed to provide for its proper utilization.

The cost of obtaining the same results by independent State surveys would vastly exceed the amount of the appropriations called for, and states, although they have already paid their share of the heavy expense already incurred, will be discouraged from undertaking much-needed surveys if they are to be thus unnecessarily burdened.

No class of men are so well aware of the value of coast survey work for the purposes mentioned in the memorial as Civil Engineers, and there is accordingly a peculiar fitness in a testimonial to Congress to that effect from the American Society.

ARGUMENT AGAINST ADOPTION.

The views expressed in the memorial as to the propriety of utilizing to the fullest extent the valuable surveys made along our coast by the United States Government, seem to be unexceptionable; and probably few, if any, Civil Engineers, who have given the subject thought, would dissent therefrom.

As individuals, probably a large majority of the American Society of Civil Engineers would be glad to see Congress act favorably in the premises; but it has not been, nor should it be the policy of this Society, as a body, associated for special purposes of mutual improvement to undertake to influence Congress by memorials. Its object might be misunderstood or misinterpreted, and its legitimate influence in the country weakened.

PROPOSED AMENDMENT TO THE CONSTITUTION.

The following is a corrected reading of the amendment to the constitution offered by Mr. Francis Collingwood at the annual meeting, November 7th, 1877, and will take the place of the proposed amendment as printed in Proceedings for November, 1877, vol. III., page 111:—

Article—(a new article).—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career and who, from ill health, advanced age, or other good reason assigned, is unable to pay such dues; and the Board may remit the whole, or part of assessments in arrears, or accept in lieu thereof desirable additions to the library and museum.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Alphabets, Medieval and Modern, Initials and Ornaments. E. G. Stagoll. London. 4to. illus. *Barnard*. 1s 6d.
Architects and Builders Pocket Book of Useful Memoranda and Prices. W. Young. London. 32mo. *Spina*. 4s. 6d.
Arithmetical Instruction, an Essay on Methods of ——. F. W. Bardwell. New York. 18mo. *Putnam*. \$0 15.
Art, The Decorative ——. William Morris. Boston. 16mo. *Roberts*. \$0 30.
Astronomy, Popular ——. Simon Newcomb. Professor U. S. Naval Observatory. New York. 8vo, illus. and maps. *Harpers*. \$4 50.
Bridges, Iron Truss ——. Methods of Calculating Strains, Comparisons of Prominent Truss Bridges and new Formulas for Computations. Col. Wm. E. Merrill. U. S. Engineers. 3d ed rev. New York. 4to. illus. *Van Nostrand*. \$5.00.

Cement, Science and Art of the Manufacture of Portland ——. with Observations on some of its constructive Applications. Henry Reid. New ed. London. 4to, illus. *Spina*. New York. \$7.00.
Centennial Exhibition. The World's Fair. A critical account. Francis A. Walker, Chief of the Bureau of Awards. New York. 8vo. *Barnes & Co.* \$0 75.
——. Official Awards and Claims of Exhibitors, and general reports of judges in the departments of Textile Materials, Fabrics and Machinery. Boston. 8vo. *National Assn. Wool Manufacturers*. \$3.50.
Ceramic Art of Great Britain. Being a History of the Ancient and Modern Pottery and Porcelain Works of the Kingdom, and of their Productions. L. Jewitt. London. 2 vols. roy. 8vo, illus. *Virtue*. 52s. 6d.
Chemistry, Elements of ——. Prof. Sidney A. Morton, Ohio Agricultural and Mechan-

- ical College. Cincinnati. 12mo. illus. *Van Antwerp, Bragg & Co.* \$1.10.
- Chimneys, Boiler and Factory —, their Draught Power and Staoility; and on Lightning Conductors. Robert Wilson. London. Crown, 8vo. *Lockwood, Crosby & Co.* 3s. 6d.
- Coal, A Practical Treatise on — Mining. George G. Andre. London. 2 vols. roy. 4to, illus. *Spons.* New York. \$28.00.
- Coloring; A Grammar of —. George A. Field. London. 12mo. (Weales Series.) *Lockwood.* 3s.
- Contracts. The law of —. John Wm. Smith. Sixth Am., from the Sixth London ed. Vincent T. Thompson. With Notes and References to both English and American cases, by William Henry Rawle, and Additional Notes and References to recent American Decisions, by Hon. George Sharswood. Philadelphia. 8vo. *Johnson.* \$5.50.
- Design; Principles of Decorative —. Christopher Dresser. London. Crown, 4to, illus., plates. *Cassell, Pelter & Galpin.* New York. \$3.10.
- Studies in — for Manufacturers, Architects, Builders, Designers, House Decorators, &c., being sixty original des gus in colors, with descriptive letter press and treatise on principles of designing. Christopher Dresser. London. Folio, illus. *Cassell, Pelter & Galpin.* New York. \$25.00.
- Dictionary of Manufactures, Mining, Machinery and Industrial Arts. George Dodd. New York. Crown, 8vo. *Van Nostrand.* \$1.50.
- Dictionary of Technology—in English, German and French. A. Tulhausen. Leipzig. *Tauchnitz.* (B. Westermann, New York.) \$3.70.
- Distillation, Destructive —. A Manual of the paraffine, coal, tar, resin, oil, petroleum and kindred industries. E. J. Mills. London. 8vo. (*Van Nostrand, New York.*) \$1.25.
- Drawing, Industrial — books. No. 3. Elements of decorative design; No. 5. Ornamental treatment of plant forms; No. 7. Principles of designing. Mark M. Maycock. Buffalo. Obl. 8vo. *M. Taylor.* Each part \$0.25.
- Engineering, Manual of Civil—. W. J. M. Rankine. 12th ed. revised by E. F. Bamber. London. Post 8vo, illus. *Griffin.* 16s.
- Engineers, The boy—: What they did and how they did it. J. Larkin. London. Sq. 16mo. *Trubner.* 7s. 6d.
- The boy—: What they did and how they did it. J. Larkin. New York. 8vo, illus. *Putnam.* \$1.75.
- , Architects and Contractors' pocket book, 1878. London. 12mo. *Lockwood.* 6s.
- Excavation and Embankment. Formulas for the calculation of—and for finding average haul. J. Woodbridge Davis. New York. 8vo. *Gillies Bros.* \$1.00.
- Form, American—book, with forms for every State and Territory. J. R. Saylor. Cincinnati. 8vo. *R. Clarke.* \$2.00.
- Foundations. Jules Gandard. Trans. by L. F. Vernon Harcourt. New York. *Van Nostrand's Science Series.* No. 34. \$0.50.
- Gas. Common Sense for gas users: a catechism of gas lighting. Robert Wil on. London. Crown 8vo, illus. *Lockwood, Crosby & Co.* 2s. 6d.
- , Engineers' and Superintendents' Almanac for 1878. New York. 16mo, tucks. *American Meter Co.* \$2.00.
- Manufacture. A practical treatise on the manufacture and distribution of Coal Gas. William Richards. London. Demy 4to, illus. plates. (*Spons. New York.*) \$12.
- Geology, Elements of—Jos. Le Conte. New York. 8vo, illus. *Appleton.* \$4.00.
- Geometry, Elements of—G. A. Wentworth. Boston. 12mo. illus. *Ginn & Heath.* \$1.00.
- Graphic Statics, Elements of—Karl Van Ott. Trans. by G. S. Clarke. (*Spons. New York.*) \$2.
- Heat, A practical treatise on—as applied to the useful arts, for use of Engineers, Architects, &c. Thos. Box. 2d ed. 8vo, illus. (*Spons. New York.*) \$5.00.
- The handbook of—, Lardner. New ed. enl. by B. Loewy. London. Post 8vo, illus. *Lockwood, Crosby & Co.* 6s.
- Harvard examination papers. New ed. with papers for 1877. Boston. 12mo, *Ginn & Heath.* \$1.50.
- Hydraulic Tables for finding the mean velocity and discharge in open channels. Thomas Higham. Roy. 8vo. (*Spons. New York.*) \$2.00.
- Hydraulics. The new formula for mean velocity of discharge of rivers and canals. W. R. Kutter. Trans. by L. D. A. Jackson. London. 8vo. (*Spons. New York.*) \$5.00.
- Landscape Gardening, Practical—F. R. Elliott. Rochester. 8vo, illus. *D. M. Dewey.* \$3.00.
- Metals, The founding of—, Edward Kirk. 3d ed. New York. 8vo. *D. Williams.* \$2.50.
- Military Engineering. Instructions in— Vol. I, Part 1, Field defence. Compiled at the School of Military Engineering. Chatham. 2d ed. Post 8vo. *British Government Publication.* 3s. 6d.
- Mineral Surveyor and Valuer's complete guide. W. Lintern. London. 12mo. (Weale's Series.) *Lockwood, Crosby & Co.* 3s. 6d.
- Mineralogy. Part 1, Advanced Science Series. J. H. Collins. New York. 12mo. *Putnam.* \$1.50.
- Mining Machinery. A descriptive treatise on the machinery, tools and other appliances used in Mining. George G. Andre, in 12 parts. London. Roy. 4to, illus. (*Spons. New York.*) Each part \$2.00.
- Mines, Accidents in—their causes and prevention. A. Bagot. London. Post 8vo. *C. K. Paul & Co.* 6s.
- Obelisks. Cleopatra's Needle, with notes on Egypt and Egyptian—. Erasmus Wilson. London. 8vo. *Brain.* 5s.
- Painting, Neutral tint — with 24 plates from designs by R. P. Leitch. The Letterpress to each Plate contains Full Instructions to the Learner, and the Plates show the progress of the work through its different stages. Oblong 4to. *Cassell, Pelter & Galpin, New York.* \$2.50.
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- Water Color —, By R. P. Leitch. With 24 Colored Plates, and Full Instructions to the Pupil as to the manner of Mixing and Applying the Colors. 2d ed. *Cassell, Pelter & Galpin, New York.* \$2.50.

Patent Office. Account of the Destruction by Fire of the North and West Halls of the Model Room in the United States Patent Office Building, Sept. 24, 1877. Together with a History of the Patent Office from 1790 to 1877. Boston. 8vo., illus. A. Williams. \$0.50.

Pattern Maker's Assistant. With tables. Joshua Rose. New York. Crown 8vo, illus. Van Nostrand. \$2.50.

Photographed Spectra. One hundred and thirty-six Photographs of Metallic, Gaseous and other Spectra, printed by the permanent Autotype Process. With Introduction, description of plates, and Index, and with an extra plate of the Solar Spectrum. J. Band Capron. *Spons. New York.* \$12.00.

Photography. A Treatise on ——. W. de W. Abney. New York. 12mo, illus. Appleton. \$1.50.

Physiology. An Introduction to the Study of Nature. T. H. Huxley. F. R. S. New York. 12mo, illus. and plates. Appleton. \$2.50.

Screw Cutting Tables for Engineers and Machinists. Lord Lindsay. London. 4to. *Spons.* 2s.

Screws. Theory of ——. A Study in the Dynamics of a Rigid Body. R. S. Ball. London. 8vo. *Simpkin,* 10s. 6d.

Slate Quarrying. A Treatise on ——. Scientific, Practical and Commercial. D. C. Davis. London. 8vo. *Lockwood.* 6s.

Specifications and Contracts. A Manual of Engineering. ——. Lewis M. Haupt. Philadelphia. 8vo, illus. T. M. Stoddard & Co. \$3.00.

Steam Engine. A practical treatise on the ——. Containing plans and arrangements of details for fixed steam engines, with essays on the principles involved in design and construction. Arthur Rigg. Demy 4to, illus. and plates. *Spons. New York.* \$17.00.

—, Considered as a Heat Engine. A treatise on the theory of the Steam Engine. Jas. H. Cotterill. 8vo, illus. *Spons. New York.* \$5.00.

Tables. Engineers, Contractors, and Surveyors' pocket table book. 10th ed. rev. J. M. Scribner, New York. 16mo. *Van Nostrand.* \$1.50.

—, Engineers and Mechanics' Companion. With Weights, Measures, Roots, Areas, Mechanical Powers, Steam Engine, &c. 18th ed. rev. J. M. Scribner. New York. 16mo. *Van Nostrand.* \$1.50.

Telephone. Researches in Electric Telephony, being a lecture delivered before the Society of Telegraph Engineers. By Prof. Alex. Graham Bell. Profusely illustrated. 8vo, paper. *Spons. New York.* \$0.60.

Virginia. Physical Survey of ——. M. F. Maury. With notes and additions. Richmond, Va. 8vo, map. *Randolph & English.* \$0.30.

Water Supply of Cities and Towns. William Humber. London. Imp. 4to, illus., plates. *Lockwood, Crosby & Co.* £6 6s.

Workshop Receipts. For the use of Manufacturers, Mechanics and Scientific Amateurs. Ernest Spon. Crown 8vo, illus. *Spons. New York.* \$2.00.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Administration des Ponts et Chaussées, Paris.

Annales des Ponts et Chaussées, November, 1877.

Annales des Ponts et Chaussées, December, 1877.

From C. F. Allen, Boston:

Report of Board of Water Commissioners of Newton, Mass., November 1, 1877. Boston.

From Phineas Barnes, Plainfield, N. J.: A Treatise on the Chemistry of Gold, Silver, Quicksilver, and Lead. Edward Price. San Francisco. 1860.

Perpetual Water Indicator and Steam Pressure Gauge. William C. Grimes. Philadelphia, 1858.

Report of the State Geologist on Metalliferous region bordering on Lake Superior. St. Paul. 1866

Report on the Hudson River Railroad. John B. Jervis. New York. 1846.

Report on Hoosac Tunnel and Troy and Greenfield Railroad, by the Joint Committee. 1866. Boston. 1867.

Silver Mining Regions of Colorado. J. P. Whitney. 1865.

The Steam Engine as it was and as it is. Hon. William H. Seward. 1853. Providence.

Glances at the Victoria Bridge and the men who built it. Charles Legge. Montreal, 1860.

Specifications of Pumping Engines and Boilers. Chicago Water Works. 1870.

From L. F. Beckwith, New York: The Pictet Artificial Ice Company. New York, 1877.

From Gen. S. V. Benét, Chief of Ordnance, Washington:

Annual Report of Chief of Ordnance U. S. A. June 30, 1877. Washington.

From Robert Briggs, Philadelphia: On the relation of Moisture in Air to Health and Comfort. Philadelphia, 1877. (Copies for distribution.)

From the Bureau of Education, Washington:

Circulars of Information of the Bureau. Nos. 1 and 2. Washington. 1877.

Contributions to the History of Medical Education and Medical Institutions in the United States. 1776-1876. Washington. 1877.

From Howard Fleming, New York: Narrow Gauge Railways in America. Philadelphia. 1876.

From T. Higginbotham, Esq., Melbourne, Australia:

Report of Observations on Railways made during a tour in Europe and America, in 1874-5. T. Higginbotham, Melbourne. 1876.

From Gen. A. A. Humphreys, Chief of Engineers, Washington :
Report of Chief of Engineers on Patent Office
Ire. Washington. 1877.
Report of Engineers upon repavement of
Pennsylvania Avenue. Washington. 1877.
United States Geological Exploration of the
4th parallel. Clarence Kin. Descriptive
Geology by A. Hague and S. F. Emons.
Washington. 1877.

From the Institution of Civil Engineers,
London :
Proceedings at Sixtieth Annual Meeting.
December 18, 1877. London.

From the Institution of Civil Engineers
of Ireland. Dublin :
Transactions of the Institution. Vol. XI.
Dublin. 1877.

From Charles Lagasse. Nivelles. Bel-
gium :
Notice sur les dragues à mouvement diacon-
tinu en usage aux Etats-Unis d'Amerique.
Ch. Lagasse. Bruxelles. 1877.

Notice sur l'explosion d'une Chaudiere rota-
tive à la Société des Papeteries des Nivelles.
Bruxelles. 1877.

L'explosion d'une mine à Hell-Gate aux Etats-
unis d'Amerique. Ch. Lagasse. Bruxelles,
1877.

From the Louisville and Nashville Rail-
road Company :
Annual Report of the Company, 1876-7.
Louisville. 1877.

From the Minister of Public Works,
Mexico :

Annals of the Public Works of the Republic
of Mexico. May to October, 1877. Mexico.
1877.

From E. Pontzen, Paris :
Die Bedeutung des Rostock. Berliner Schiff-
fahrtskanala. Moritz Wiggers. Rostock.
1877.

XIII und XIV Jahresbericht des Vereins für
Erdkunde zu Dresden. 1877.

From Messrs. Shedd & Sawyer. Boston :
Report of Water Commissioners of Newton,
Mass., Nov. 1, 1877. Boston. 1877.

From S. H. Shreve, Morristown, N. J. :
Proceedings of Commissioners of Rapid
Transit in the City of New York. July to
December, 1875. New York. 1877.

From the Smithsonian Institute, Wash-
ington :
Annual Report of Board of Regents of the
Smithsonian Institute. 1876. Washington.
1877.

Transactions of the Austrian Society of En-
gineers and Architects. May to September,
1877, incl. Vienna. 1877.

From R. H. Thurston, Hoboken, N. J. :
On a new type of Steam Engine, theoretically
capable of utilizing the full me-
chanical equivalent of heat Energy. R. H. Thurston,
Philadelphia. 1877.

From Wrlton and Bonnet, Waterbury.
Conn. :
Eleventh Report of the Water Commissioners
of the City of Waterbury. Hartford. 1877.

ANNOUNCEMENTS.

Members of the Society who expect to visit
Europe during the present year, are request-
ed to inform the Secretary as soon as possible
of that fact, and also of the time when they
purpose leaving and the probable length of
their stay abroad.

The Tenth Annual Convention of the So-
ciety will be held in Boston about the middle
of the month of June, 1878. The precise date
and particulars will soon be announced.

The Journal of the Austrian Society of
Engineers and Architects for December, 1877,
publishes a review by Mr. C. F. von Popp of
the paper by Mr. Clinton B. Sears, on the
Principles of Tidal Harbor Improvement as
applied at Wilmington, California, (Transac-
tions Vol V, No. CXXXI. page 388).

In the publication "Excerpt Minutes of
Proceedings of the Institution of Civil En-
gineers, Vol. LI, Session 1877-8, Edited by James
Forrest, Secretary, abstracts of the following
papers published in the Transactions of this
Society are given :

Proportions of Eye-Bar Heads and Pins as
determined by Experiment, by C. Shaler
Smith. (Transactions, Vol. VI, No. CXLVII,
page 263.)

Wing Dams in the Mississippi above the
Falls of St. Anthony, by Edward P. North.
(Transactions, Vol. VI, No. CXLVIII, page
268.)

Title Page and List of Contents of Volume
VI of Transactions and Title Page and Index
of Volume III of Proceedings are issued with
this number.

The following resolution was adopted at
the Ninth Annual Convention of the Society,
and ordered printed regularly in the Society
publications :

Whereas, the metric system of weights and
measures is now extensively used abroad ;
and whereas, it is desirable that the relation
of the unit of differing systems be made
familiar to all, by comparison :

Resolved, that members be requested,
in papers hereafter presented to the Society,
to write, in parenthesis, weights or dimen-

sions by the metric system in connection with those of the system in general use.

THE ATTENTION OF MEMBERS IS EXPRESSLY called to the following resolution, passed after the reading of the paper published in the present number of Transactions:—

Whereas, It has appeared in the discussion of the paper on cements, contributed by W. W. Macley that other members of the Society have data bearing on this subject, which is valuable and interesting, but which they may deem hardly extensive enough to form the subject of separate papers, and whereas, there is doubtless, a large amount of such information in the possession of individual members of the Society:

Therefore Resolved, That the members of the Society be requested to communicate to the Secretary any unpublished information they may have on the subject of cements which they are willing to make public, the same to be edited by the Secretary and published by him in a single paper.

IN TRANSMITTING LETTER BALLOTS members of the Society are requested to conform in all respects with the printed regulations issued with the ballots. These regulations are frequently not complied with. Ballots are received without the signature of the member on the outer envelope, with initials instead of full signature or with other irregularities. When laid before the Society such irregular ballots have been thrown out and members sending them have lost their votes. The regulations seem to be as simple as possible to secure a fair secret ballot.

ILLUSTRATIONS OF PAPERS presented for publication should be distinctly drawn in broad, sharp lines, upon white, smooth (not "egg" or enamelled) paper, with perfectly (not glossy, or gray) black ink, to a scale twice or thrice greater than the print is to be: which in no case should require folding in more than one direction (i. e., the depth of plate, as inserted in Transactions, should not exceed 7 inches). Shades are to be produced by variations in size and spacing of black lines; no brush work or colors are admissible. Unless figures and letters can be well put in, simply pencil them, leaving the engraver to insert them on the plate. Always put a linear scale upon each drawing.

MEMBERS OF THE SOCIETY are requested to contribute papers on Engineering subjects, giving results of practice, or discussing pertinent theoretical questions; their comments upon papers published in Transactions are solicited, and they are urged to contribute from note-books and other records whatever may bear upon the subjects considered, or upon other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, vol. 1.

DONATIONS TO THE LIBRARY.—Members and others are asked to contribute regularly to the library of the Society, copies of government, municipal, railway, canal and other reports, specifications, profiles, maps, photographs and like matter, making up the record of engineering operations for the past or present, and to inform the Secretary where such may be had. Duplicate copies are desired, for transmission to foreign societies in return for works collected and sent to this library by them; also for exchange with members and others who wish complete sets referring to particular subjects. Donations of old or new reports or pamphlets which refer to or illustrate Engineering constructions or operations are particularly solicited. Many of these may be really of great importance as a part of the Library, and as possibly containing information which might not otherwise be preserved.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock, A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

The Library and Conversation Rooms will also, for the present be open every Thursday evening, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

ALLEN, C. FRANK. Assistant Engineer Newton Water Works, 66 Vernon St., Boston, Mass. Feb. 6th, 1878.

	Date of Election.
GILBERT, C. P. Civil Assistant Engineer, United States Engineer Office, 85 Washington Av., Detroit, Mich. Feb. 6th, 1878.	
MARSLAND, EDWARD. Marine Engineer, Sing Sing, N. Y. " " "	

JUNIOR.

CLARK, IRA E. City Engineers' Office, Cambridge, Mass. " " "	
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CHANGES AND CORRECTIONS.

MEMBERS.

CLARKE, FREDERICK W. Civil Engineer, Room 24, 80 Dearborn St., Chicago, Ill.	
COOPER, THEODORE. Care Keystone Bridge Co., Pittsburg, Pa.	
DARRACH, CHARLES G. 100 North 39th St., Philadelphia, Pa.	
DAVIS, CHAS. E. L. B. Captain of Engineers U. S. A., P. O. Drawer 432, New Orleans, La.	
FALCONNET, E. F. Engineer N. & T. R. R. Co., Lebanon, Tenn.	
FARQUHAR, F. U. Maj. of Engineers U. S. A., Rock Island, Ill.	
GOLAY, PHILIP. 307 Court St., Cincinnati, Ohio.	
LATROBE, CHARLES H. 146 North Charles St., Baltimore, Md.	
MCCLINTOCK, W. H. Asst. Eng. Louisville Water Co., Fair Grounds, Jef- ferson Co., Ky.	
NICHOLS, O. F. Maderia & Mamoré Railway, care of P. & T. Collins, 207 Walnut Place, Philadelphia, Pa.	
PARKHURST, H. W. Division Engineer, R. C. St. L. & C. R. R., Glasgow, Howard Co., Mo.	
READ, ROBERT L. Civil Engineer, 57 West Third St., Cincinnati, Ohio.	
SEARLES, WILLIAM H. Civil Engineer, Rochester, N. Y.	
SEDGWICK, THOMAS S. Superintendent of Construction U. S. Court House and Post Office, Austin, Texas.	
SMITH, C. SHALER. 215 Washington Ave., St. Louis, Mo.	
STRIEDINGER, JULIUS H. 17 University Place, New York.	
WURTELE, ARTHUR S. C. 115 West Eagle St., Buffalo, N. Y.	

JUNIORS.

HORTON, SANFORD. Covington, Nebraska.	
KNIGHT, WILLIAM B. Care of Panama R. R. Co., 7 Nassau St., New York.	
LUCAS, D. JONES. Lock Box 133, Warren, Pa.	

DECEASED.

TRACY, JOHN F. Fellow. February 13th, 1878.	
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV, February, 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MARCH 6TH, 1878.—The Society met at 8 P. M., Vice-President Roberts in the chair.

The ballot upon the following amendment to the By-Laws was canvassed :—

SECTION 23; SUB-SECTION 5TH.—Strike out the explanatory clause in brackets, from the words "[The term" — — to "Associate is not]."

The Sub-Section will then read :—

5th.—A Junior shall be one who has had actual practice in some of the branches of civil, military, mining or mechanical engineering, for not less than two years; or if a graduate of a scientific or collegiate institution—for not less than one year.

Upon this there were: For the amendment, 75 votes, against the amendment, 7 votes. This amendment was thereupon declared adopted.

A paper by Edward S. Philbrick, entitled "The Improvement of the South Boston Flats by the Harbor Commissioners of the State of Massachusetts," was read by the Secretary.

MARCH 20TH, 1878.—The Society met at 8 P. M., Vice-President Fink in the chair. A paper by R. H. Thurston, entitled, "On a New Method of detecting overstrain in iron and other materials, and on its application in the investigation of the causes of accidents to bridges and other constructions," was read by the author, and discussed by him and Messrs. Collingwood, Emery, Haswell, Holley, Macdonald and Worthen.

OF THE BOARD OF DIRECTION.

MARCH 6TH, 1878.—Applications for membership were considered. Financial and other business transacted.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Aid Book to Engineering Enterprises abroad.** Ewing Mathewson. 8vo. *Spons.* New York. \$4.25.
- Alphabets.** Tompson's Roman —, with scales and proportions. Also specimens of ornamental, distorted and perspective letters. New York. 12mo, illus. *F. W. Devoe & Co.* \$0.75.
- Architecture.** Scottish Woodwork of the Sixteenth and Seventeenth centuries. J. W. Small. Edinburgh. Folio, illus. *D. Douglas.* 84s.
- **Home Interiors.** E. C. Gardner. Boston. *Houghton, Osgood & Co.* \$1.50.
- Armies.** The — of Asia and Europe, embracing official reports on the armies of Japan, China, India, Persia, Italy, Russia, Austria, Germany, France and England. Accompanied by letters descriptive of a journey from Japan to the Caucasus. Gen. Emery Upton, U. S. A. New York. 8vo. *Appleton.* \$3.00.
- Belting, a Treatise on the use of — for the transmission of Power.** John H. Cooper. Philadelphia. 8vo, illus. *Claxton, Remsen & Haefelfinger.* \$3.50.
- Blasting Rock —; a practical Treatise on the means employed in Blasting Rock for industrial purposes.** Geo. G. André. London. 8vo, illus. Plates. *Spons.* New York. \$4.25.
- Bridge, Kansas City —, with an account of the regimen of the Missouri river, and a description of Methods used in founding in that river.** O. Chanute and Geo. S. Morrison. New York. 4to, illus. Plates. *Van Nostrand.* \$6.00.
- Capital, Conflicts of — and Labor.** Including chapters on the history of Guilds, Trades Unions, Apprentices, Technical Education, Intimidation and Picketing, Restraints on Trade, Strikes—their Objects, Aims, and Results. Trade Councils, Arbitration. Co-operation. Friendly Societies, the Labor Laws, &c. George Howell. London. Crown 8vo. *Chatto & Windus* 7s 6d.
- Chemistry, a Treatise on —.** H. E. Roscoe and C. Schorlemmer, Professors of Chemistry in Owens College, Manchester, England. Volume I. The New Metallic Elements. New York. 8vo, illus. *Appleton.* \$5.00.
- **The Chemist's Manual.** A practical Treatise on Chemistry, including Qualitative and Quantitative Analysis, Stoichiometry, Blow-pipe Analysis, Mineralogy, Assaying, Toxicology, &c., &c. Henry A. Mott, Jr. New York. 8vo. *Van Nostrand.* \$6.00.
- **Naquet's Legal —.** A Guide to the Detection of Poisons, Falsification of Writings, Adulteration of Alimentary and Pharmaceutical Substances, Analysis of Ashes, and Examination of Hair, Coins, Arms, and Stains, as applied to Chemical Jurisprudence, for the use of Chemists, Physicians, Lawyers, Pharmacists, and Experts. Translated from the French by J. P. Battershall. New York. 12mo. *Van Nostrand.* \$2.00.
- **Qualitative Chemical Analysis.** A Guide to the Practical Study of Chemistry, and in the work of Analysis. S. H. Douglas and A. B. Prescott. Second edition, rev. New York. 8vo. *Van Nostrand.* \$3.50.
- Dictionary, Brande's — of Science, Literature and Art.** Re-edited by the Rev. Sir G. W. Cox. Rev. ed. London. 3 vols. 8vo. *Longmans.* 63s.
- Engineering, Notes on — Construction.** Embracing Discussions of the Principles Involved, and Descriptions of the Material employed. J. E. Shields, C. E. New York. 12mo. *Van Nostrand.* \$1.50.
- Iron and Steel, Strength and Calculation of Dimensions of —** — Constructions with reference to the latest Experiments. J. J. Weyrauch. New York. 12mo. Plates. *Van Nostrand.* \$1.00.
- Manufactures, The — of Cincinnati, and their relation to the future progress of the city.** S. D. Maxwell, Cincinnati. 8vo. *R. Clarke.* \$0.25.
- Manures, Artificial Manures: How to make, buy, value and use.** A. Sibson. London. 8vo. *Ridgway.* 2s. 6d.
- Mathematics, American journal of —** — pure and applied. Ed. by I. I. Sylvester, W. E. Story, B. Peirce, S. Newcomb, and H. A. Rowland. Published under the auspices of the Johns Hopkins University. V. I. Pt. I. 4to, pp. 104. Baltimore. *E. Westerman & Co. New York.* Per vol. \$5 00.
- Matter and Motion, J. Clerk Maxwell.** New York. 16mo, illus. *Van Nostrand's Science Series.* \$0.50.
- Mechanic, The Amateur Mechanic's Practical Hand-book.** Describing the different tools required in the workshop, the uses of them and how to use them; also examples of different kinds of work, etc., with full descriptions and drawings. Arthur H. G. Hobson. Philadelphia. 16mo, cloth, illus. *Claxton, Remsen & Haefelfinger.* \$1.25.
- Mechanical Powers, Hughes's Easy Lessons on the —.** With Copious Exercises by one of Her Majesty's Inspectors of Schools. London. 12mo. *Stewart.* 1s.
- Ordnance, Woolwich System of Rifled —.** A contribution to the history of its invention. By its Inventor. London. 8vo. *Hodgson.* 1s.
- Parks, Our parks to be or not to be: papers read before the New York Academy of Sciences, April 30, 1877, and February 1, 1878, by a physician.** New York. 12mo. *Brentano.* \$0.15.
- **Central Park Reports.** 13 vols. half calf, extra. New York. *H. K. Van Siclen.* \$75.00.
- Price Book. The Builder's and Contractor's — for 1878.** (Lockwood & Co.'s) Revised by Francis T. W. Miller, Architect and Surveyor. With Latest Prices up to present date. 12mo, half-bound, 4s.; limp cloth, 3s. 6d.
- Printing. The invention of —** — a collection of facts and opinions descriptive of early prints and playing cards: the black-

- books of the fifteenth century ; the legend of Lourens Jansezoon Coster of Harlem, and the work of John Guttentberg and his associates. Illus., with facsimiles of early types and wood-cuts, 2d ed., 8vo, pp. 556. Theo. L. De Vinne New York. *Francis Hart & Co.* \$6.00.
- Railways, Remunerative — for new countries ; with some account of the first railway in China. Richard C. Rapier. London. Cr. 4to, illus. and photos. *Spons, New York.* \$6.00.
- Sanitary Science, The future of — —. B. W. Richardson. London. 8vo. *Macmillan.* 1s.
- Sewer Gas and how to keep it out of houses : A hand book on House drainage. 3d ed., 12mo. O. Reynolds. London. *Van Nostrand, New York.* \$0.60.
- Health and Healthy Homes : how to secure healthy and comfortable homes. London. 8vo. *Sanitary Engineering Co.* 6d.
- Science Conferences, held in connection with the Special Loan Collection of Scientific Apparatus, at the South Kensington Museum, on Chemistry, Biology, Physical Geography, Geology, Mineralogy and Meteorology. By the most eminent English and Foreign Scientists, 12mo, cloth. New York. *Scribner, Welford & Armstrong.* \$2 25.
- Science Primers : Chemistry. H. E. Roscoe ; Physics, Balfour Stewart ; Physical Geography, A. Geikie ; Geology, A. Geikie ; Physiology, M. Foster ; Astronomy, J. N. Lockyer ; Botany, J. D. Hooker ; Logic, W. S. Jevons ; Inventional Geometry, W. G. Spencer ; Pianoforte, Franklin Taylor. New York. 18mo. *Appletons.* Each, \$0.45.
- Star-finder, or Planisphere with movable horizon : arranged by G. W. Plympton. New York. In colors, on card-board. *Van Nostrand.* \$1.00.
- Steam Jacket, The abuse of the — — practically considered, W. Fletcher. London. Crown 8vo. *Spons, New York.* \$1.25.
- Telephone, All about the — and Phonograph. Containing descriptions of Bell's and Dolbear's Telephones and Edison's Phonograph ; History of the Discovery, Details of Construction, and interesting experiments. London. 12mo. *Ward & Lock.* 1s.
- The : Its History, Construction, Principles, and Uses, with definite instructions on the Making of Telephones, by which Failure is impossible, and to which is added a chapter on the Phonograph. S. Garner. London. 12mo. *Simpkin.* 1s.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From the Association of Civil Engineers of Portugal :
Review of Public Works and Mines, October, 1877. Lisbon.
- From S. Thayer Abert, Washington :
Report upon improvement of Rivers and Harbors in District of Columbia, Virginia and North Carolina. Washington. 1877.
- From Administration des Ponts et Chaussees, Paris :
Annales des Ponts et Chaussees, January, 1878.
- From John W. Bacon, Danbury, Conn. :
Twenty-fifth Annual Report of the Railroad Commissioners of Connecticut. Hartford. 1878.
- Fifth Annual Report of the Railroad and Warehouse Commission of Illinois. Springfield. 1875.
- Sixth Annual Report of the Railroad and Warehouse Commission of Illinois. Springfield. 1876.
- Third Annual Report of the Commissioner of Railroads of Michigan. Lansing. 1874.
- Fifth Annual Report of the Commissioner of Railroads of Michigan. Lansing. 1876.
- Third Annual Report of the Railroad Commissioners of Wisconsin. Madison. 1870.
- From Gen. J. G. Barnard, New York :
Investigation of Accidents on Railroads. J. G. Barnard. Washington. 1877.
- Report by Capt. M. R. Brown, relating to work at South Pass, Mississippi River. Jan. 29th, 1878. Washington. 1878.
- From Board of Health of City of Brooklyn :
Report of the Board, 1875-6. Brooklyn. 1877.
- From Board of Railroad Commissions of Massachusetts :
Ninth Annual Report of the Board. Boston. 1878.
- From G. Bouscaren, Cincinnati :
Report on progress and construction of the Cincinnati Southern Railway. December 1st, 1877. Cincinnati. 1878.
- From Capt. M. R. Brown, New Orleans :
Eighth Report upon improvement of the South Pass, Mississippi River. December 15th, 1877. Washington. 1878.
- From E. S. Chesbrough, Chicago :
Report of Commissioners for Testing the West Side Pumping Engines. April 25th, 1877. Chicago. 1877.
- From the Department of the Interior :
Contributions to the history of Medical Education and Medical Institutions in the United States. Special report. N. S. Davis. Washington. 1877.
- From the Engineers Club of Philadelphia :
Description of the Wilcox Spouting Well. Charles A. Ashburner. Philadelphia. 1877.
- Oil Well Records, selected from collections of J. F. Caul. Survey of Oil District of Pennsylvania. J. P. Lealey. Philadelphia. 1877.

Silurian Plants. Leo Lesquereux. Philadelphia. 1877.

From Walton W. Evans, New York :
American Engines and Fairlie Engines compared. Walton W. Evans. New York. 1877.

From the Franklin Institute, Philadelphia :
Journal for March, 1878.

From Charles H. Haswell, New York ;
Piece of White Marble perforated by the Boring Sponge while sunk in the Brig Grecian on the Long Island Coast. 1870.

From Geo. Howland, Jr., New Bedford, Mass :
Eighth Annual Report of the Acushnet Water Board. New Bedford. December. 1877.

From Gen. A. A. Humphreys, Washington :
Map of the Battle-field of Gettysburg, in three parts.

Report of the Chief of Engineers, U. S. A. Parts 1 and 2 for 1877. A. A. Humphreys. Washington.

Physics and Hydraulics of the Mississippi ; reply to criticisms made by Dr. Hagen, Director General of Public Works of Prussia. A. A. Humphreys.

Report of the Commissioners to examine the Moline Water Power. 1877.

Report of Capt. M. R. Brown relating to South Pass, Mississippi River. 1878.

Report of Major G. Weitzel on the Louisville and Portland Canal, for the year 1877.

Information relating to improvement of the Providence River and Narraganset Bay, Rhode Island. January 31st, 1878.

From William R. Hutton, Baltimore :
Photolithographs and specifications of Movable Dam, designed for Kanawha River Improvement.

From the Institution of Civil Engineers, London :
Abstracts of Papers in Foreign Transactions and Periodicals.

Description of Coffor dams used at Dublin, Birkenhead and Hull. Wm. James Doherty. London. 1877.

From the Institution of Mechanical Engineers, London :
Proceedings of the Institute. November. 1877.

From the Iron and Steel Institute, London :
Journal of the Institute. 1877.

From G. Leverich, Brooklyn :
Municipal Reports of San Francisco for 1876-7.

From Mansfield Merriman, New Haven :
A list of writings relating to the method of least squares, with historical and critical notes. Mansfield Merriman. New Haven. 1878.

From the North of England Institute of Mining and Mechanical Engineers, Newcastle upon-Tyne :
Transactions of the Institute, vol. xxvi, 1876-7. Transactions of the Institute, September and October, 1877.

From William H. Paine, New York :
Specifications for Cast Iron Wire Rope Sockets for the suspenders of the East River Bridge, 1877.

Specifications for Granite Face, Arch, and other stone for approaches for East River Bridge, 1877.

Specifications for Steel Cable Wire for East River Bridge, 1877.

Specifications for Wrought Iron Cable Bands and Bolts for Suspenders of East River Bridge, 1877.

From E. S. Philbrick, Boston :
Annual Report of Board of Harbor Commissioners. Boston. 1877.

From Ernest Pontzen, Paris, France :
Thirteen Lithographed Working Drawings of Structures at Vienna Exhibition. R. v. Waldheim. Vienna.

From E. Prince, Quincy, Ill. :
Revised List of Water Works in the United States and Canada, so far as known. E. Prince. 1877.

From William Rotch, Fall River, Mass. :
Report of the Watuppa Water Board. Fall River Water Works. January 1st, 1878.

From the Royal United Service Institution, London :
Journal of the Institution. No. xciii. 1877.

From Franz Rziha, Vienna :
Eisenbahn Unter- und Oberbau. 2d Part. Franz Rziha. Vienna. 1877.

ANNOUNCEMENTS.

THE TENTH ANNUAL CONVENTION of the Society will be held at Boston, beginning Tuesday, June 18th, 1878.

Sessions for the consideration of professional subjects, and one for the transaction of business will be held.

When determined by the Local Committee, the arrangements in detail will be announced.

The following is a list of topics to be considered with reference to papers published in Transactions during the preceding year.

BRIDGES.

CXL. Approximate determination of stresses in the Eye-Bar Head. WILLIAM H. BURR.

CXLIV and CXLIX. Relative quantities of material in bridges of different

kinds, of various heights. CHARLES E. EMERY.

CXLVII. Proportion of Eye-Bar Heads and Pins as determined by experiment. C. SHALER SMITH.

BOILERS.

CXLI. Connected-Arc Marine Boilers, a demonstration of the principles of their construction. CHARLES E. EMERY.

— Discussions on above paper. J. FOSTER FLAGG. Vol. VI., page 294.

CEMENTS.

CLII. Notes and Experiments on the use and testing of Portland Cement. WILLIAM W. MACLAY.

DAMS.

- CXLVIII. Wing Dams in the Mississippi above the Falls of St. Anthony. EDWARD P. NORTH.

HYDRAULICS.

- CXXXIX. The Consumption and Waste of Water delivered by Public Works. JAMES H. HARLOW.
- CXL. The flow of water in open channels. THEODORE G. ELLIS.
- CLIV. A peculiar case of failure in a water main. D. MCN. STAUFFER.
- Discussion on above paper. Vol. VII, page 15.

MASONRY.

- CLI. Nomenclature of Building stones and stone Masonry. J. JAMES R. CROES, WILLIAM E. MERRILL and EDGAR B. VAN WINKLE.

MINES AND BLASTING.

- CXI. On the simultaneous ignition of thousands of mines and the most advantageous grouping of fuses. JULIUS H. STRIEDINGER.
- CLIII. On igniting blasts by means of electricity. JULIUS H. STRIEDINGER.

PRESERVATION OF TIMBER.

- Discussion on this subject. Vol. VI, page 189.

RIVERS AND HARBORS.

- CXLII. Improvement of Entrance to Galveston Harbor. CHARLES W. HOWELL.
- CLV. The Improvement of the South Boston Flats. EDWARD S. PHILBRICK.
- Discussion on Levees as a system for reclaiming low lands. J. FOSTER FLAGG. Vol. VI, page 305.

SURVEYS.

- CXXXVIII. Co-ordinate Surveying. HENRY F. WALLING.
- CXLVI. A novel railroad survey. THOMAS S. HARDEE.
- CL. Description of survey for determining the slope of water surface in the Erie Canal. WILLIAM H. SKARLEN.

In addition to the above papers, it is expected that the following subjects will be presented by papers printed previous to the date of the Convention, or read at its meeting.

- Dams across Water Courses. WILLIAM J. MCALPINE.

A new method of detecting overstrain in iron and other metals, and its application in the investigation of the causes of accidents to bridges and other constructions. ROBERT H. THURSTON.

- The law of Tidal Currents. J. H. STRIEDINGER.

The South Pass Jetties; descriptive and incidental notes and memoranda. E. L. CONTHILL.

Construction and operation of the Incline Plane Railroad at Madison, Ind. M. J. BECKER.

Reminiscences and experiences of early engineering operations on railroads, with especial reference to steep inclines.

No. 1, W. MILNOR ROBERTS.

No. 2, WILLIAM J. MCALPINE.

Resistances on Railway Curves. S. WHINERY.

Steam engine economy. A uniform basis for comparison. CHARLES E. EMERY.

Agricultural Drainage. ED. N. KIRK TALLCOTT.

A graphic method of representing railroad accounts. CHARLES LATIMER.

Science, old and new. W. MILNOR ROBERTS.

Members of the Society are earnestly requested to furnish information or memoranda upon any of the subjects referred to. They are also invited and expected to take part in the discussions either in person or by sending to the Secretary notes for presentation.

In either case, it will assist the Committee in arranging the details for sessions of the Convention, if members expecting to take part in the discussions, will notify the Secretary at once to that effect.

THE ANNUAL MEETING of the American Institute of Mining Engineers will be held at Chattanooga, Tennessee, beginning Wednesday, May 22d, 1878.

MEMBERS who desire to secure complete sets of the Transactions of the Society are requested to send to the Secretary a list of the papers which are needed to fill up their sets. Some of the earlier papers are out of print. If orders are received for a sufficient number to warrant the expense, a reprint will be made.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

The Library and Conversation Rooms will also, for the present, be open every Thursday evening, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

Members of the Society who expect to visit Europe during the present year, are requested to inform the Secretary as soon as possible of that fact, and also of the time when they purpose leaving and the probable length of their stay abroad.

The following resolution was adopted at the Ninth Annual Convention of the Society and ordered printed regularly in the Society publications :

Whereas, the metric system of weights and measures is now extensively used abroad ; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison :

Resolved, That Members be requested, in papers hereafter presented to the Society to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
NOBLE, ALFRED.....(Junior to Member) Asst. U. S. Engineer, Sault St. Marie, Mich.....	April 3, 1878.
POST, JAMES C.....Captain of Engineers U. S. A., P. O. Box 266, Savannah, Ga.....	Feb. 6. 1878.

JUNIORS.

HAYES, EDMUND.....	Care of Morison, Field & Co., Engineers and Bridge Builders, Buffalo, N. Y.....	March 6, 1878.
KELLOGG, NORMAN B.....	Care of Fox & Kellogg, 530 California St., San Francisco, Cal.,.....	Feb. 6, 1878.
PRINCE, EDWARD.....	Hotel de Boston, 22 Louis le Grande, Paris, France.....	" " "

CHANGES AND CORRECTIONS.

MEMBERS.

ALDRICH, JAMES C.....	51 East Twentieth St., New York.
BAXTER, GEORGE S.....	Greenwich, Conn.
BUELL, RICHARD H.....	Room 47, 206 Broadway, New York.
FINK, RUDOLPH.....	Asst. Supt. W. C., Virginia, Midland and G. S. Railroad, Alexandria, Va.
PETTIT, ROBERT E.....	Asst. Engineer of Maintenance of Way, Penna. R. R., Union Depot, Pittsburgh, Pa.
SEARLES, WILLIAM H.....	Civil Engineer, Room 57, Coal and Iron Exchange, New York.

JUNIORS.

HORTON, SANFORD.....	A. T. & S. F. R. R. Rocky Fora, Colorado.
TASKER, CHARLES A.....	Civil Engineer and Surveyor, 180 West 4th St., Cincinnati, Ohio.

ASSOCIATE.

FORD, ARTHUR L.....	Care of Garvalena y Ca. Caibarien, Cuba.
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RESIGNED.

SANDBERG, CHRISTER P.....	Member.....	April 2, 1878.
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV, March, 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 3d, 1878.—The Society met at 8 P. M., Vice-President Roberts in the Chair. The Secretary reported that there had been an attendance of members at the rooms on each Thursday evening while they had been open, and it was resolved that the Library and Conversation Room should be kept open for the present and until further action on each Thursday evening from 7½ to 10 o'clock.

Mr. E. P. North, on behalf of the Committee on Exhibit at Paris, reported progress in the collection of material for such exhibit.

The ballot upon the adoption of the following memorial was canvassed :—

To the Honorable the Senate and House of Representatives of the United States in Congress assembled :

The American Society of Civil Engineers respectfully represents to your honorable bodies, that the triangulation of the United States Coast Survey, wherever it extends, affords a convenient and accurate basis for the location of roads, railroads and public works of all kinds, as well as for topographical and other surveys ; a basis which for precision and completeness is otherwise practically unattainable.

And the said Society, according their hearty approval of the United States laws, whereby the Coast Survey Department is authorized to extend its triangulations over States where scientific surveys are ordered by the State Legislatures, respectfully petitions your honorable bodies to make the necessary appropriations for continuing such triangulations as may be called for under the said laws, whereby the valuable work of the Coast Survey may be more fully utilized, to the great advantage of all portions of the country.

Upon this there were :—

For adoption, 73 votes ; against adoption, 66 votes. The memorial was thereupon declared adopted.

On motion, it was ordered that two copies of the memorial be engrossed, signed by the President and Secretary, and forwarded, one

to the Senate and one to the House of Representatives of the United States Congress.

The ballot upon admission to membership was canvassed, and the following were declared elected :—

As Members, O. L. Glover, of Lima, Peru, and Alfred Noble, of Detroit, Mich. (elected Junior February 10, 1875) ; as Junior, Edmund Hayes of Buffalo, N. Y.

A paper by Julius H. Striedinger, entitled "The Law of Tidal Currents in River Harbors," suggested by the paper on Improvements in Boston Harbor, was read by the author, and the subject discussed by Messrs. Collingwood, Haswell, W. J. McAlpine, and Roberts.

Mr. Bogart read from advance sheet of the Transactions of the Institution of Civil Engineers an account of the plan and construction of the Hooghly floating bridge in India.

APRIL 17TH, 1878.—The Society met at 8 P. M., Vice-President Roberts in the Chair.

A paper by M. J. Becker, entitled "The Construction, Machinery and Operation of the Incline Plane Railroad at Madison, Ind.," was read by the Secretary. The subject was discussed and illustrated by Messrs. Chanute, Forney, William J. McAlpine, Roberts, Yardley and others.

The Society then adjourned, and on invitation, through Mr. William J. McAlpine, proceeded to the rooms of Mr. Johnson, who exhibited to the Society the construction and operation of the Edison speaking phonograph.

OF THE BOARD OF DIRECTION.

APRIL 3D, 1878.—Applications for membership were considered. Appropriations were made. Questions of copyright were considered.

NOTES AND MEMORANDA.

UNITED STATES BOARD TO TEST IRON, STEEL AND OTHER METALS.—The attention of members of the Society is called to the following resolutions which were adopted at the last annual convention. The Committee of the Society upon the same subject urges upon all interested in the important work undertaken by this Board the fact that action in accordance with these resolutions must be taken at once to be of any avail. The Board must soon pass out of existence, unless further legislation is had.

Resolutions adopted at the 9th Annual Convention of the American Society of Civil Engineers :

"Whereas, in 1872, a committee of members of the American Society of Civil Engineers was appointed to take into account and to ascertain the best way of establishing a Board for the testing of such metals and alloys as form parts of the structures and machines required for use by the citizens of this country ; and

"Whereas, under this appointment, the committee proceeded in its labors so far as to obtain favorable action from the Congress of the United States, by a law authorizing the creation of a Board for the purpose of making such tests, and appropriating money to be expended therefor as well as in purchase of suitable machinery ; and

"Whereas, at a late session of Congress a law was passed, whereby said Board would cease to exist upon the expenditure of the money then appropriated; be it

"Resolved, that this Society deems the tests proposed to be made, to be of national importance, and therefore asks that so much of the Sundry Civil Appropriation Bill, passed by Congress, as provides that the Board to test iron, steel and other metals, shall be discontinued when the money appropriated for its use shall have been expended, be repealed; that the unexpended balance to the credit of the Board be re-appropriated, and that such further appropriation made be for the use of the Board as may be needed to complete

the investigations undertaken—the sum required for the coming year being \$40,000.

"Resolved, that each member of this Society be urged to use such influence as he may possess, to obtain favorable and immediate action by the Congress of the United States in furtherance of the objects here prayed for.

"Resolved, that the above resolutions be printed, and several copies furnished to each member of this Society, to be used by him in promoting the object sought; and that reports of their action in the matter be made by each to the Secretary, giving names of representatives in Congress who have been addressed or seen on the subject."

NOTES OF MEETINGS.

A portfolio of a number of the original drawings of the first construction of the Philadelphia & Reading Railroad was sometime since presented to the Society by Mr. MONCURE ROBINSON, Honorary Member of the Society.* Extracts from the letter of Mr. Robinson sent with the portfolio, from the pamphlets which accompanied it and from the remarks made by W. MILNOR ROBERTS, at the time of the presentation are appended.

From the letter of Mr. MONCURE ROBINSON to Vice-President Roberts:

" * * * I am gratified to learn that you and Mr. Bogart think the plans of works on the Philadelphia & Reading Railroad will be interesting to many of our members, and I will take great pleasure in forwarding them. I will enclose with them a short report made to the Board of Directors in December, 1839, after the *first trial* of the Gowan and Marx and an account by Mr. Nicolls, the superintendent of the road of her *first regular performance* in February, 1840. I will add to them an address by Professor R. E. Rogers to the Franklin Institute in 1874, in the appendix to which you will find some extracts from publications of the period contemporary with the Gowan and Marx, showing the sensation made in Europe as well as in the United States by her performance. To this was due the invitation given Messrs. Eastwick and Harrison to visit St. Petersburg to make a contract for building the locomotives and other machinery for the St. Petersburg & Moscow Railroad, a contract which Mr. Har-

rison has often said to me was the foundation of the large fortunes made there by himself and his copartners. * * *

From a report, dated Philadelphia, December 10th, 1839, made to the Directors of the Philadelphia & Reading Railroad Company by Messrs. Moncure Robinson and Wirt Robinson, Engineers of the Company:

"The undersigned are gratified in being enabled to report that the line of railroad between this city and Reading was on Thursday last opened for transportation. The Company's engine, the Gowan and Marx, on that day left Reading with a train of eighty cars, conveying, with other articles,

1,635 barrels of flour,
73½ tons of blooms,
6 tons of coal,
2 hogsheads of whiskey,
60 persons.

The weight of the train, exclusive of the engine and tender, being 368 tons and the net load conveyed 240 tons.

The failure of one of the water pipes of the engine arrested the train after the lapse of an hour, in which time it had progressed twelve miles from Reading, and made it necessary to await the arrival of another engine, the Delaware. By this engine the whole train was first pushed four miles to a siding at Pottstown and thence drawn on twenty-four miles to Norristown.

The whole weight of the Delaware, including fuel and water is ten and a quarter tons, and of the Gowan and Marx ten and seven-tenths tons.

It is hoped that this performance of engines of lighter dimensions than those now gene-

* See Proceedings, Vol. III, page 136, December, 1877.

rally ordered for heavy transportation will satisfy such of the stockholders as have hitherto been sceptical that the results anticipated by the undersigned will be at least realized, and that the load of an engine from the coal mines to the city will not be less than the amount (150 tons) estimated in their report of September, 1838. If this be so, there can be no room for doubt that the cost of transportation estimated in that report (52½ cents per ton), will not be exceeded. This results, on the largest estimates of the expenses of a train, as unavoidably, from the amount of the load conveyed as the latter does from the graduation of the road.

The board will now probably be better satisfied than ever that the plan of improvement they have adopted was the only proper one for the objects they had in view. If instead of a graduation, the worst case of which is a level, undulations not exceeding thirty feet to a mile had been admitted, the load of the engine would have been but little more than one-third of its present load, and the cost of transportation would have been increased in nearly a corresponding ratio. While the first cost of the road has been somewhat greater on the plan adopted, the cost of transportation has been reduced very nearly to its minimum. The company has thereby insured large profits on articles which can bear the customary rates of railroad transportation, and more or less profit on every article brought on their improvement, and which can be transported at all in any other way."

"The undersigned have given much attention to the description of engines most judicious for your road. Among those in general use hitherto some (the English pattern) possessed the advantage of great adhesion, but without the requisite facility in turning curves. Others with this last advantage had the weight of about half the engine only on their driving wheels, their adhesion not only being diminished in proportion, but the weight on each driving wheel being still so great as rapidly to wear out the tires of the wheels, and to produce unnecessary injury to the rails. In addition to these disadvantages in most of our engines in ordinary use, it was essential to the plan of engine for our road that it should be as well as possible adapted to the use of anthracite coal, and to slow motion. The result of the attention given by us to this subject, has so far been most satisfactory. The engine, the 'Gowan and Marx,' above mentioned as the one used on the occasion of the opening of the road for transportation, is geared for slow motion (having but

three feet three inch driving wheel), and a velocity of from eight to ten miles per hour, her draft and generation of steam with anthracite coal, appear to us as perfect as in any locomotive that we know of. With the advantage of a truck for turning curves, she has three-fourths of her weight thrown on four instead of two driving wheels, giving her thereby a large amount of adhesion, but with the weight so divided as to be but little injurious to the tire of the wheel or the road. We are not without hopes that, aided by the suggestions of her ingenious builders, Messrs. Eastwick and Harrison, of this city, and our other experienced manufacturers we may be enabled to attain the whole adhesion of the engine without giving up the guide truck, and to divide the weight equally on all the wheels of the engine; points essential to obtaining at slow velocities, the maximum useful effect of the engine, and to diminish the wear and tear, both of engines and the road. In the mean time, it will be gratifying to the Board to know that we are in possession of two plans of engine for burning anthracite coal, that of the Gowan and Marx above described, and that adopted on the Baltimore and Ohio Railroad, which will realize all that it was ever expected their road would perform, and far transcend all that was promised at its commencement, and that any farther improvements in the plan of locomotive adapted to it, will only add still further to its useful effect, and reduce still further in the wear and tear of engines and the road; adding, of course, in a corresponding ratio, to the value of the work."

From a report made by G. N. NICOLLS, Superintendent Transportation, P. and R. R. R., dated Reading, February 24th, 1840:

"Statement of the performance of the locomotive engine Gowan and Marx, built by Messrs. Eastwick and Harrison, Philadelphia, on the Philadelphia and Reading Railroad, with a train of one hundred and one loaded cars, February 20th, 1840.

"Gross weight of train, including cars and freight, but not including engine or tender, 423 tons of 2 240 lbs.

Net weight of freight, 268½ tons of 2 240 lbs.

The freight consisted of—2 002 barrels of flour, 82 do. whiskey, 459 kegs of nails, 19 tons of bar iron, 22 hhds. of meal, 5 do.

* Included in this report is an estimate for an increased supply of rolling stock, which gives as cost of locomotives \$7,500 each; of coal cars \$270 each, and of ordinary freight cars \$250 each.

whiskey, 4 do. oil, and sundry other articles, making a total of 268½ tons.

Distance from Reading to the foot of the inclined plane on the Columbia Railroad 54½ miles. Running time of the engine with train, five hours thirty-three minutes; rate 9.82 miles per hour. Coal consumed, red ash, anthracite, from Schuylkill county, 5 600 lbs. Water evaporated, 2 774 gallons.

GRADES OF ROAD.

The total fall from Reading to the point where the train was stopped near the Columbia Railroad is 214.5 feet, being an average fall of 3.94 feet per mile. There is *no ascending grade* from Reading to the Columbia Railroad, with the exception of about 2 100 feet at its lower termination, graded at 26.4 feet per mile, upon which grade the train was stopped; the other grades vary from 19 to 15 feet per mile; there are only three miles graded at 18 feet and one at 19 feet per mile.

The total length of *dead level* line from Reading to the Columbia Railroad is 27 miles and 4 200 feet; of this the long-st level is 9 miles and 1 500 feet long, between Norristown and the inclined plane; the others vary from 1 550 feet to 4 miles and 1 600 feet in length.

STATE OF THE TRACK.

Owing to the frost coming out of the ground at this season, the track was in worse order than at any other time of the year; this, however, did not materially affect the performance of the engine, as the embankments were all in nearly as good order as at other times; and at comparatively few points in the deep cut, was the track sufficiently out of line or level to offer increased resistance to the train.

The superstructure of the road consists of a T rail, 45 lbs. to the yard, laid upon sills 7 feet long and 7 by 8 inches square, 3 feet 1½ inches apart from centre to centre, and laid on broken stone.

STATE OF THE RAILS.

For the first twenty miles the rails were in very bad order, the morning was cloudy, and a fog of the previous night had left sufficient moisture on the surface of the rails to diminish considerably the adhesion of the engine; for the remainder of the distance the weather was clear and the rails in good order.

WORKING OF THE ENGINE.

On three different occasions the engine started the whole train on a dead level, and when on a dry rail, without the wheels slipping.

The steam ranged from 80 lbs. to 130 lbs. per square inch, to which latter pressure the safety valve was screwed down.

The draught of the engine was created by the escape steam passing into, and from, a tubed exhaust box,—no other draft was used while running; at the water stations "Beilly's patent fan" was used when fresh coal was thrown on the fire, but at no other time.

The speed of the train was noted when passing through some curves of 819 feet radius on the 9 mile level, and found to be 9.8 miles per hour: on a straight line on the same level the engine attained a speed of 10.5 miles per hour.

So little was the engine affected by her performance on the 20th, that on the 23d she drew, on her return trip, 88 burden cars, 9 of which were loaded, and a locomotive engine, making a gross weight of 163 tons of 2 240 lbs., not including engine or tender, up a grade of 18.4 feet per mile. The train had a strong head wind against it during the whole trip, which, owing to its length, 1 206 feet, was sensibly felt at some exposed points of the road, and must have proportionably affected the power of the engine.

WEIGHT AND DIMENSIONS OF THE ENGINE "GOWAN AND MARX."

Weight when empty 21 640 lbs. In running order, with fuel and water, 24 660 lbs., on four driving wheels in running order, or with water, fuel, and two men, 18 260 lbs. Cylinders 12", by 16 inch stroke; 8 wheels, 4 of which are driving wheels, coupled, 3 feet 4 inches diameter; truck wheels 2 feet 6 inches diameter.

The weight of the burden cars averaged from 1.5 to 1.65 tons, of 2 240 lbs. each; they were all 4 wheeled—wheels 3 feet diameter, and 4 feet 6 inches apart from centre to centre.

The above performance, of an 11 ton engine, is believed to exceed any on record in this or any other country."

From the remarks made by Mr. MILNOR ROBERTS at the time of the presentation to the Society of the original drawings of works on the Reading Railroad:

In regard to the locomotive "Gowan and Marx," to which Mr. Robinson refers in his letter, and upon the performance of which Mr. Nicolls, at that time Superintendent of Transportation on the Reading Railroad, made his report in February, 1840, allow me to mention briefly some of the principal features of the road, the engine and its performance.

I recollect very well the sensation it created at the time both in this country and in Europe, as showing a material advance in loco-

motive construction. Previously, most of our locomotives had but two driving wheels, and their normal power of hauling was very much less than that exhibited by the Gowan and Marx.

The Reading Railroad had been very carefully and judiciously located by Mr. Robinson, its Chief Engineer, so as to present only descending or level grades from the coal region to Philadelphia, in the Schuylkill valley. There is one level of nine miles. The aggregate of the levels between Reading and Philadelphia is 27 miles, being about half of the distance. The residue has grades not exceeding 19 feet per mile; the whole distance, 54½ miles, averaging 3.94 feet per mile.

The real test was upon the 9 mile level, where the engine pulled the train through some curves of 819 feet radius at the rate of 9.8 miles per hour; and on a straight line of 10.5 miles per hour.

The train consisted of 101 four-wheeled cars, which weighed 154½ tons, of 2 240 lbs. (average weight of single car, 1.53 tons). The freight weighed 268½ tons, of 2 240 lbs. (average load per car, 2.66 tons). Total weight of train, exclusive of engine and tender, 423 tons of 2 240 lbs.; being about 39 times the weight of the locomotive, which was 11 tons.

The weight of the locomotive, when empty, 21 640 lbs. In running order, with fuel and water, 24 660 lbs. Weight on the four drivers, in running order, with water, fuel and two men, 18 260 lbs.

Cylinders 12½ inches by 16 inch stroke; 8 wheels, four of which were driving wheels, coupled, 3 feet 4 inches diameter; truck wheels, 2½ feet diameter.

The 4 wheeled cars had wheels 3 feet diameter, 4 feet 6 inches apart, from centre to centre.

Track laid with T rail, 45 lbs. per yard; gauge 4 feet 8½ inches.

The engine started the whole train on a level.

The steam ranged from 80 lbs. to 130 lbs. The draft of the fire was created by the escape steam passing into and from a tubed exhaust box. "Reilly's patent fan" was used when fresh coal was thrown on the fire, but at no other time.

The concluding remark of Mr. Nicolls report is, "The above performance of an 11 ton engine, is believed to exceed any on record in this or any other country." The date of this performance was February 24, 1840; almost 38 years ago.

Many changes, and numerous improvements have been made during these 38 years,

in the construction and use of American railroads, locomotives and cars; and the capital invested in some of our most important roads is, in some cases, ten, fifteen, and even twenty times more than it was originally. The business also has been immensely augmented: though not proportionally with the augmented capital. The weight of the rail has been increased about 50 per cent., the weight of the empty car, upon 4 wheels, instead of being only 3 360 lbs., is at least two and a-half times as much, or, say 8 400 lbs., while the freight now carried is little more than the weight of the car, whilst in 1840, the car carried one and three-fourths times its weight. At the present day, if the passenger cars and sleepers, and cattle cars are taken into the account, the roads actually carry little, if any, more than the weight of the cars.

Locomotives weighing four times as much as the Gowan and Marx, cannot pull four times the amount of gross load pulled by that engine; much less can they transport four times her net load of freight.

Allowing 8 tons (of 2 240 lbs.) for the weight of a car, and 10 tons (of 2 240 lbs.) for the load of each car, it would require 212 cars, weighing 1 696 tons, to carry 2 120 tons of load; the total weight being 3 816 tons.

The performance of a 44 ton engine of the present day, might possibly be about half of this.

That is, if it be assumed that an engine might now pull a gross weight of 1 908 tons, it would convey but 848 tons of freight; or 4½ times the gross weight of the Gowan and Marx train, could show only 3½ times the freight that was carried on that train.

A battle has been raging for some years between armor plates on one side, and penetrating projectiles on the other; and the question may be asked, whether there is not another engineering battle now going on, between the weight and material of the rails, to withstand, and the weight and power of the locomotives and trains to destroy. In both cases, large sums are needed to carry out the experiments. It is a question, whether in the grandeur of certain things, we may not have passed the economical point.

An occasional reference to the railroads experience of forty years ago, may serve to show that some practical mechanical knowledge then existed, and that it was applied with good results.

I can state as within my own experience in the Alleghany Portage Railroad, Pennsylvania, in 1834, that there were performances of locomotives built by Wm. Norris, of Philadelphia,

in running over smooth rails up inclines of over 500 feet per mile; and one of his engines at one time conveyed a passenger car, with 50 passengers in it, up an incline of 422 feet per mile, at the rate of ten miles per hour.

THE FOLLOWING LETTER has been received from the *Verein Deutscher Ingenieure* (Society of German Engineers) :

To the American Society of Civil Engineers :

In the expectation that many of the American engineers who may visit the Exposition at Paris, will feel an interest in the industries of Germany, which, as is known, will not be represented in Paris, and thinking that they may desire on this occasion to visit the factories and works of Germany, the *Verein Deutscher Ingenieure* remembering most gratefully the very kind and hospitable reception enjoyed by German engineers at the time of the Exposition at Philadelphia, offers most heartily a cordial welcome to its American colleagues, and desires to render all possible service to them.

We have therefore the honor, in the name of the Verein, to invite the members of the American Society of Civil Engineers or such other American Engineers as may be introduced by the Society, to visit the various industrial districts of Germany, and we add herewith a list of persons who have themselves offered to assist by information and introductions, such visitors from the United States as may apply to them.

With high esteem, in the name of the *Verein Deutscher Ingenieure*,

FR. EULER,
President,

Director of the Iron Works,
Kaiserlauten.

Prof. Dr. F. GRAFHOF,
Director, Karlsruhe.

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12. BAVARIA.

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C. Linde, Professor am Polytechnicum, München.

Zemann, Redacteur von Dingler's Polytechnischem Journal, Augsburg.

A. Frommel, Gerant der Spinnerel und Weberel, Augsburg.

G. Ulsch, Professor der Kgl. Industrieschule, Nürnberg.

Hilpert, Director der Maschinenbau-Gesellschaft, Nürnberg.

Professor Dr. von Wagner, Würzburg.

Noll, Director der Waggonfabrik, Würzburg.

13. BADEN.

Professor Dr. Meidinger, Vorstand der Landsgewerbehalle in Carlsruhe.

14. PALATINATE—SAARBRÜCKEN.

Dingler, Machensfabrikant in Zweibrücken.

Ingenieur Kanfer, firma: Eisenwerk Kaiserslauten, Kaiserslauten.

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15. MIDD. & RHINE.

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16. LOWER RHINE.

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Hegener, Director der städtischen Gas und Wasserwerke in Köln.

Fabrikbesitzer Dr. Grüneberg (Chemische Fabrik), Köln.

AMENDMENT TO BY-LAWS.

Mr. F. Collingwood has proposed for the consideration of the Society the following amendment to the By-Laws, and on his motion, seconded by Mr. Wilson Crosby, it has been directed to be printed and issued with the announcement that it would be regularly moved at the approaching Tenth Annual Convention:

An Amendment to the By-Laws, to take the place of Section 31, adopted at the Ninth Annual Convention, April 25th, 1877.

SECTION Any member entitled to vote for officers of the Society may, before the third Wednesday of September in any year, nominate such officers for the ensuing year, by presenting the names of such nominees

in writing, over his own signature, in a sealed envelope, addressed to the Board of Direction, and endorsed, "Nominations for officers."

The Board of Direction or those of its members present at a meeting of the Board, to be held on said third Wednesday of September, for this purpose, shall prepare a list in alphabetical order, under the title of each office, of all the persons thus nominated and eligible to the respective offices, together with the class of membership of each as to whether resident or non-resident.

Within one week thereafter, the Secretary shall mail such list, with a copy of this section, to all members of whatever class.

Members qualified to vote for officers may do so by striking from or adding to this list, and return the same as their ballots, but each ballot shall contain not more than one name for President, one for Secretary, one for Treasurer and one for Librarian, two names for Vice-President and five names for Directors. Of these, one Vice-President, the Secretary, the Treasurer, the Librarian and three Directors must be resident members.

The vote shall be by letter, in like manner as prescribed for admission to membership, and be canvassed at the Annual Meeting next succeeding said third Wednesday in September.

The presiding officer shall appoint three or more tellers for the canvass, who shall reject all ballots not in conformity with the Constitution and By-Laws, and report the result in full to the meeting in writing, such report to be preserved by the Secretary for reference.

The nominee for any office receiving the greatest number of legal ballots shall be declared elected to that office.

If, in any case, in consequence of two or more nominees receiving an equal number of votes, there is no election of a particular officer, the members present, who are entitled to vote, shall elect such officer by plurality ballot, from those nominees receiving the highest number of votes.

A ballot entirely in writing shall not be rejected for that reason.

Mr. Edward P. North has proposed for the consideration of the Society the following amendment to the Constitution, and on his motion, seconded by Mr. M. N. Forney, it has been directed to be printed and issued with the announcement that it would be offered at the approaching Tenth Annual Convention:

AMENDMENT TO CONSTITUTION.—To amend Article V, as far as relates to the election of a Secretary, as follows:

Hereafter the Secretary shall be appointed by the Board of Direction, and hold his office during their pleasure.

This amendment shall take effect on its passage, and its provisions shall apply to the Secretary elected in November next.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

- Alphabets; a Monogram and— Album. New York. New ed. 8vo. *Sabin*. \$5.00.
- Archæology. Lake Dwellings of Switzerland and other parts of Europe. F. Keller. New York. 2 vols. 8vo, illus. Plates. *Scribner, Welford & Armstrong*. \$21.00.
- Architecture; Handy book of Villa —. C. Wickes. London. 4to, illus. Plates. *Crosby, Lockwood & Co.* 42s.
- Old homes made new, being a collection of Plans, exterior and interior views, illustrating the alteration and remodelling of several suburban residences, with explanatory text. W. Woollett. New York. Folio, illus. *Bicknell*. \$1.50.
- Art; Essay on Decorative. Geo. B. Warren, Jr. Troy. 8vo. *W. H. Young*. \$0.25.
- Atlantic, The: An Account of the General Results of the Voyage during the year 1873 and the early part of the year 1876. Sir C. Wyville Thomson, F. R. S. With a Portrait of the author, many colored Maps. Temperature Charts, and Illustrations. New York. 8vo. *Harpers*. \$12.00.
- Botany: Structural and Physiological —. Otto W. Thorne, Professor of Botany at the School of Science and Art at Cologne. Trans. and ed. by A. W. Bennett, of St. Thomas' Hospital. 600 Woodcuts and colored Map. New York. Small 8vo. 2d ed. *Wiley & Sons*. \$2.25.
- Brakes: Continuous Railway —. A Letter to the Right Hon. Sir Charles Adderley, President of the Board of Trade. By a frequent Railway Traveler. London. 8vo. *Trubner*. 6d.
- Bridges: Practical Treatise on the Construction of Iron Highway —. For the use of Town Committees: together with a short Essay upon the application of the principles of the Lever to a ready analysis of the strains upon the more customary forms of Beams and Trusses. With many fine Engravings. A. P. Boller, A. M., C. E. New York. 1 vol. 8vo, cloth. 2d ed. *Wiley & Sons*. \$2.50.
- Carriage Builders' Reference Book. With Illustrations and Descriptions of Centennial Exhibits. I. D. Ware. Philadelphia. 8vo, illus.
- Catalogue; a general — of choice books for the library; comprising a selection of the best books by ancient and modern authors, in all departments of literature, science, and art. Classified and priced. Cincinnati. 12mo. *Clarke*. \$0.25.
- Chairman's Handbook. 3d ed. Reginald F. D. Palgrave, Clerk-Assist. of the House of Commons. London. *Knight & Co.* 1s. 6d.
- Chemistry. Industrial —. A Manual for Technical Schools, Chemists and Manufacturers. Based upon a translation (partly by Dr. T. Barry) of Stohmann & Engler's German edition of *Payens Précis de Chemie Industrielle*. Edited throughout and augmented by B. H. Paul, Ph. D. Illustrated by 698 Engravings and containing nearly 1000 pages. New York. 8vo. *Wiley & Sons*. \$10.00.
- Corporations. The New York Act for the Formation of — for Manufacturing, Mining, Mechanical, and other purposes. With all the Amendments. Notes, Forms, and Index. Compiled by a member of the New York Bar. New York. 12mo. *Baker, Voorhis & Co.* \$0.50.
- Design; a Primer of —. Charles A. Barry. Supervisor of Drawing, Public Schools, Boston. *Lee & Shepard*. (Announcement.)
- Drainage: House — and water service in cities, villages, and rural neighborhoods. With incidental consideration of causes affecting the healthfulness of dwellings. Jas. C. Bayles. New York. 8vo. *D. Williams*. \$3.00.
- Drawing. An Elementary Course of Geometrical —; containing Problems on the Right Line and Circle, Conic Section and other Curves, the Projection, Section, and Intersection of Solids, the Development of Surfaces, and Isometric Perspectives. With 38 Plates. 16 by 20. George L. Vose. Boston. *Lee & Shepard*. (Announcement.)
- Elements of Machine Construction, or Machine Drawing, with some Elements of descriptive and rational cinematics. A text book for schools of Civil and Mechanical Engineering and for the use of Mechanical Establishments, Artisans and Inventors—containing the principles of Gearing, Screw Propellers, Valve Motions, and Governors, and many standard and novel examples, mostly from present American practice. S. Edward Warren, late Professor in the Rensselaer Polytechnic Institute. New York. 2 vols. 8vo, illus, plates. *Wiley & Sons*. \$7.50.
- Industrial—comprising the Description and uses of Drawing Instruments, the construction of Plane figures, the Projections and sections of Geometrical Solids, Architectural Elements, Mechanism and Topographical Drawing, for the use of academies and common schools. By Prof. D. H. Mahan. Revised and enlarged and chapter on colored topography added by Prof. D. F. Thompson of Troy. New York. 8vo, 30 plates. *Wiley & Sons*. \$3.50.
- Dynamics. Elements of —; Mechanics. With numerous Examples and Examination Questions. J. Blakie. Edinburgh. Post 8vo. *Simpkin, London*. 3s. 6d.
- Engineering. Aid book to — enterprise abroad. Ewing Matheson. London. 8vo. *Spinks*. 12s. 6d.
- Engineers. Proceedings of the Association of Municipal and Sanitary — and Surveyors. Edited by L. Angel. London. Vol. 3. 8vo. *Spinks*. 10s. 6d.
- Explosives. Guide book to the — Act, 1875. For the use of local authorities and their officers. By Major Majendie, R. A., H. M. Inspector of Explosives. By authority. Bound in leather, 320 pages London. *Knight & Co.* 2s.

- Graphical Statics. Elements of — and their application to Framed Structures.** With numerous practical Examples: Cranes, Bridge, Roof and Suspension Trusses; Braced and Stone Arches; Pivot and Draw Spans; Continuous Girders, etc.; together with the best methods of calculation, and containing also new and practical formulae for the Pivot or Draw-span, Braced Arch, Continuous Girder, &c. 2 volumes, 8 vo; 1 vol. text and 1 vol. plates—2d ed. Prof. A. Jay DuBois, Professor of Engineering in Sheffield Scientific School—late Professor at Lehigh University. New York. Wiley & Sons. \$5.00.
- Guide. The Pacific tourist, illustrated transcontinental — of travel from the Atlantic to the Pacific Ocean.** 1878. New York. 4to. H. T. Williams. \$1.50.
- Iron and Steel.** The calculations of strength and dimensions of iron and steel constructions; with reference to the latest experiments. By Prof. J. J. Weyrauch, of Polytechnic Institute of Stuttgart. Translated by Prof. H. Jay DuBois. The only authorized translation. In 1 vol. New York. 8vo, plates. Wiley & Sons. \$1.50.
- Indian Population—How shall we treat the red man?** Lieut. E. O. Otis, U. S. Army. New York. 12mo. Sheldon. \$1.50.
- Irrigation. Facts and Fallacies regarding — as a Prevention of Famine in India.** John Dacosta. London. 8vo. W. H. Allen. 6d.
- Mechanics. Principles of Elementary — designed to give more attention to the fundamental principles of mechanics.** DeVolson Wood, Prof. of Mathematics and Mechanics in Stevens Institute. New York. 12mo, illus., cloth, 150 pp. Wiley & Sons. \$2.00.
- Military Engineering. Instructions in — Vol. I, part 4, Military Mining, compiled at the School of Military Engineering, Chatham.** 2d ed. Post 8vo. British Government Publication. 1s. 6d.
- Mineralogy, A Text-Book of —, Based upon the System of Mineralogy by J. D. Dana. Embracing an extended treatise on Crystallography and Physical Mineralogy.** By E. S. Dana, Curator of Minerals y, Yale College. With upwards of 800 woodcuts, and one colored plate. New York. 8vo, cloth. 2. Ed. Wiley & Sons. \$5.00.
- , **A Manual of Determinative — and Blow Pipe Analysis,** by George Jarvis Brush, of Sheffield Scientific School. New York. 8vo. 2d Ed. Wiley & Sons. \$3.00.
- , **A new revision of the above, with New Notation, conforming with Dana's Text Book on Mineralogy.** Wiley & Sons. (Announcement.)
- Modern Countries. Resources of —** Alex. J. Wilson. 2 vols. 8vo. Scribner, Wel-ford & Armstrong. \$12.00.
- Navy. Records of Living Officers of the United States — and Marine Corps.** Comp. from official sources. Lewis R. Hamersly. Philadelphia. 3d ed. rev. 8vo. Lippincott. \$5.00.
- , **The Gun, Steam, and Torpedo; or, Manœuvres and Tactics of a Naval Battle of the Present Day.** By Com. Gerard Noel, R. N., the Royal Yacht. London. Crown, 8vo, illus. Simpkin. 8s. 6d.
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- Pennsylvania Rail Road. History of the —** —, Republished from the London Engineering. 220 pp. of text, 60 illustrations, more than 100 tables, 79 plates, including about 25 double page plates. 1 vol. folio, 450 pp. Half morocco. Sold by subscription. Wiley & Sons. Previous to issue, \$15.00; after issue, \$20.00.
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- Pocket Book of Useful Formulae and Memoranda for Civil and Mechanical Engineers, with a valuable contribution on Telegraphs** by R. S. Brough and Paget Higgs. G. L. Molesworth. London. 32mo. 19th Ed. Spens. 6s.
- Railway Manual, Bradshaw's —, Shareholder's Guide, and Official Directory for 1878.** London. Post 8vo. W. J. Adams. 12s.
- Sanitary Engineering. Wholesome Houses: Being an Exposition of the Banner System of Sanitation.** 25th ed. Ed. G. Banner. London. 12mo, illus. Crosby, Lockwood & Co. 1s.
- , **Practical Information as to the Law relating to the Removal of Nuisances and Public Health.** London. Knight & Co. 1s.
- Science Lectures at South Kensington, Vol. I.** By Capt. Abney, R.E., F.R.S.; Professor Stokes, Professor Alexander B. W. Kennedy, C.E.; F. J. Bramwell, Esq., C.E., F.R.S.; Professor F. Forbes, H. C. Sorby, F.R.S., J. T. Bottomley, M.A., F.R.S.; Sidney H. Vines, B.A., B.Sc.; Professor Carey Foster. New York. 12mo. Macmillan. \$1.75.
- Sea Terms. French — and Phrases.** By Lieut. Fornain, French Navy. London. 8vo. Simpkin. 4s.
- Steam Engine. The Theory of the —** — Trans. from the 4th ed. of Weisbach's Mechanics, by Prof. A. Jay DuBois. With an Appendix of Practical Examples of Stationary, Marine and Locomotive Engines, showing American practice, by R. H. Buel. New York. 8vo, illus. Wiley & Sons. \$6.00.
- , **Simple and Compound Engines. Their Relative Merits,** by Niel Macdougall, Esq., Admiralty, London. Second Edit., demy 8vo, illus. 3s. 6d.
- Statistical Tables. Hubner's Universal —** — containing Area in square miles; Forms of Government; Head of ditto; Population; Expenditure; National Debt; Paper Money; Notes in Circulation; Standing Army; Navy; Merchant Vessels; Imports; Exports; Chief Native Produce; Money, Weights, and Measures; Chief Towns and Seaports; Population of Cities of all Countries in the World. 1 sheet imperial. London. Trubner. 1s. 9d.
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Vision. On defects of ——— which are remediable by optical appliances. A course of lectures delivered at the Royal College of Surgeons of England. Robt. Brudenell Carter. London. 8vo. *Macmillan*, New York. \$2.50.

Water Supply of Cities and Towns. A Comprehensive Treatise on the ——— With numerous specifications of existing water works. William Humber. London. 1st American edition, 4to, illus., and 50 double plates. *Geo. H. Frost (Engineering News) Chicago*. Issued in 12 parts. For each part, \$1.25; for 12 parts, \$10.00.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Administration des Ponts et Chaussées, Paris:
Annales des Ponts et Chaussées, March, 1878.

From Argentine Scientific Society, Buenos Ayres:
Annals of the Society, February and March, 1878.

From Austrian Society of Engineers and Architects, Vienna:
Transactions of the Society, Parts 3 and 4, 1878.

From Theodore Belpaire, Paris:
Tables permettant d'effectuer rapidement les calculs relatifs à la stabilité des voûtes. Theodore Belpaire, Paris.
Essai d'une Théorie des Voutes en berceau, en arc de cercle et en plein centre. Theo. Belpaire, Paris.

From Boston Public Library:
The Bulletin of the Library, No. 45. April, 1878.

From the Buffalo Board of Water Commissioners:
Ninth Annual Report of the Buffalo City Water Works for 1877. Buffalo.

From the Engineers' Club of Philadelphia:
Report of the Committee of the Club on the Metric System of Weights and Measures. Philadelphia, 1878.

From the Hanover Society of Engineers and Architects:
Transactions of the Society, Part 2, 1878. Hanover, 1878.

From D. Farrand Henry, Detroit, Michigan:
The 26th Annual Report of the Board of Water Commissioners. Detroit. (3 copies.)

From A. L. Holley, New York:
The Strength of wrought iron as effected by its composition and by its reduction in rolling. Philadelphia, 1878. (10 copies.)

From the Imperial Russian Polytechnic Society:
Proceedings and Transactions of the Society. Vol. I, 1878. St. Petersburg.

From the Institution of Civil Engineers:
Minutes of Proceedings of the Society. Vol. LI. Session 1877-78, Part 1. London.

From John B. Jervis, Rome, N. Y.:
The Future of the Erie Canal. John B. Jervis. 1878.

From the Ministry of Public Works, Paris, France:
Year Book of Public Works for year 1878. Paris.

From E. P. North, New York:
Salisbury iron, its composition, qualities, and uses. Salisbury, Conn.
General Powder and Electric Blasting Apparatus. May, 1878. Laffin & Rand Powder Co., New York.

From the North of England Institute of Mechanical and Mining Engineers:
Transactions of the Society, November and December, 1877. Newcastle-upon-Tyne, 1878.

From Charles Paine, Cleveland, Ohio:
Eighth Annual Report of the President and Directors of the Lake Shore and Michigan Southern Railway. 1877. Cleveland, 1878.

From Ernest Pontzen, Paris, France:
Etude sur l'Exploitation des Chemins de fer par l'Etat. M. F. Jacquien, Paris.
Der Lupkower Tunnel der Ersten ungarisch galizischen Eisenbahn. Rudolph R. V. Gunesch. Vienna.

From Levi W. Post, Jersey City:
Annual Report of the Chief Engineer of the Board of Public Works of Jersey City. December 31, 1877. New York, 1878. (10 copies.)

From the Railroad and Warehouse Commission of Illinois:
Seventh Annual Report. Springfield, Ill.

From Hon. Saml. J. Randall:
Congressional Record, 45th Congress, 2d Session, April 21st, 1878, Washington.

From I. W. Smith, Sacramento, Cal.:
Report of the Board of Transportation Commissioners to the Legislature of California, December, 1877.

Explanation of Tables, &c., Supplementary Report of Board of Transportation Commissioners of California, January 14th, 1878.

Blanks for years 1876 and 1877 for reports of railroads to Board of Transportation Commissioners of California.

Legislative Acts in relation to Railroads of California. 1878.

From J. Herbert Shedd, Boston: Report in relation to Sewerage of the City of Lynn, and a report of the Committee on Drainage. J. Herbert Shedd. Lynn. 1877.

From the Saxon Society of Engineers and Architects, Leipzig: Transactions of the Society. 1877.

From the Technical and Administrative Military Committee, Vienna: Communications upon Artillery and Engineering Operations. 2d part. 1878.

From the Treasury Department, Washington: Annual Report of the Light House Board to the Secretary of the Treasury. 1877.

From R. H. Thurston, Hoboken, N. J.: Thermal and Mechanical Properties of Air shown by lithographed curves due to changes of temperature, pressure and volume. R. H. Thurston. 1877.

Abstract of Statement of the extent and character of the work of the United States Board appointed to test Iron, Steel, and other Metals. R. H. Thurston. Salem, Mass.

On a new method of planning researches, and of representing to the eye the results of combination of three or more elements in varying proportions. R. H. Thurston. Salem, Mass.

The Growth of the Steam Engine. R. H. Thurston, New York, 1878.

From S. Whipple, Albany, N. Y.: An investigation as to the mode and amount of attraction between large and small bodies in contact or at small distances. S. Whipple. Albany, N. Y., 1877. (several copies.)

From H. M. Wightman, Boston: Annual Report of the City Engineer of Boston for the year 1877.

From W. W. Wilson, Yonkers, N. Y.: Fifth Annual Report of the Board of Water Commissioners of the City of Yonkers. 1877.

From David Williams, New York: The Metallurgical Review. Vol. I.

From A. F. Wrotnowski, New Orleans, La.: Report of the Board of State Engineers of Louisiana for the year 1876. New Orleans, 1878.

ANNOUNCEMENTS.

THE TENTH ANNUAL CONVENTION of the Society will be held at Boston, beginning Tuesday, June 18th, 1878.

Sessions for the consideration of professional subjects, and one for the transaction of business will be held.

The meetings of the Convention will be held in the Hall of the Massachusetts Institute of Technology, on Boylston street, which has been kindly placed at the disposal of the Society for this purpose.

The first session of the Convention will be at 10 A. M., Tuesday, June 18th, and for that and the following days the following general programme is proposed:

TUESDAY, JUNE 18TH.—Sessions at 10 A. M., and at 7½ P. M. During the afternoon, by invitation of the Boston Society of Civil Engineers, an excursion will be made by rail to Newton Upper Falls (Aqueduct Bridge, Boston Water Works), thence returning to the city via the Chestnut Hill Reservoir and suburbs of Boston.

WEDNESDAY, JUNE 19TH.—Sessions at 10 A. M., and at 7½ P. M. Such portion of the evening session as may be determined upon to be for the transaction of business. During the afternoon several excursions to places of interest about the City of Boston will be made. Each of these excursions will be in charge of a member of the Local Committee, and visitors will elect which one to join.

THURSDAY, JUNE 20TH.—By invitation of the Boston Board of Trade, an examination of the upper harbor of Boston and its improvements, and an excursion down the harbor. Convention dinner in the evening, at the Hotel Brunswick.

FRIDAY, JUNE 21ST.—By train to Lowell, and examination of the works of interest there. Thence to Lawrence, and, after visiting that City, return to Boston.

By invitation of Gen. A. P. Rockwell, President of the Eastern Railroad, an excursion will be made over that road to North Conway, and thence by the Portland & Ogdensburg Railroad to the Incline at Mount Washington.

The following is a list of topics to be considered with reference to papers published in Transactions during the preceeding year: BRIDGES.

CXL. Approximate determination of stresses in the Eye-Bar Head. WILLIAM H. BURR.

CXLIV and CXLIX. Relative quantities of material in bridges of different kinds, of various heights. CHARLES E. EMEY.

CXLVII. Proportion of Eye-Bar Heads and Pins as determined by experiment. C. SHALER SMITH.

CLVI. A new method of detecting overstrain in iron and other metals, and its application in the investigation of the causes of accidents to bridges and other constructions. ROBERT H. THURSTON.

BOILERS.

CXLI. Connected-Arc Marine Boilers, a demonstration of the principles of their construction. CHARLES E. EMERY.

— Discussion on above paper. J. FOSTER FLAGG. Vol. VI., page 294.

CEMENTS.

CLII. Notes and Experiments on the use and testing of Portland Cement. WILLIAM W. MACLAY.

DAMS.

CXLVIII. Wing Dams in the Mississippi above the Falls of St. Anthony. EDWARD P. NORTH.

HYDRAULICS.

CXXXIX. The Consumption and Waste of Water delivered by Public Works. JAMES H. HARLOW.

CXLV. The flow of water in open channels. THEODORE G. ELLIS.

CLIV. A peculiar case of failure in a water main. D. MCN. STAUFFER.

— Discussion on above paper. Vol. VII., p. 15.

MASONRY.

CLI. Nomenclature of Building stones and stone Masonry. J. JAMES R. CROES, WILLIAM E. MERRILL and EDGAR B. VAN WINKLE.

MINES AND BLASTING.

CXLII. On the simultaneous ignition of thousands of mines and the most advantageous grouping of fuses. JULIUS H. STRIEDINGER.

CLIII. On igniting blasts by means of electricity. JULIUS H. STRIEDINGER.

PRESERVATION OF TIMBER.

— Discussion on this subject. Vol. VI., page 189.

RAILROADS.

CLVIII. Construction and operation of the Incline Plane Railroad at Madison, Ind. M. J. BECKER.

RIVERS AND HARBORS.

CXLIII. Improvement of Entrance to Galveston Harbor. CHARLES W. HOWELL.

CLV. The Improvement of the South Boston Flats. EDWARD S. PHILBRICK.

— Discussion on Levees as a system for reclaiming low lands. J. FOSTER FLAGG. Vol. VI., page 305.

STEAM ENGINES.

CLVII. Steam engine economy. A uniform basis for comparison. CHARLES E. EMERY.

SURVEYS.

CXXXVIII. Co-ordinate Surveying. HENRY F. WALLING.

CXLVI. A novel railroad survey. THOMAS S. HARDEE.

CL. Description of survey for determining the slope of water surface in the Erie Canal. WILLIAM H. SEARLES.

In addition to the above papers, it is expected that the following subjects will be presented by papers printed previous to the date of the Convention, or read at its meeting :

Dams across Water Courses. WILLIAM J. MCALPINE.

The rain fall during a storm in October, 1869. JAMES B. FRANCIS.

The law of Tidal Currents. J. H. STRIEDINGER.

The South Pass Jetties ; descriptive and incidental notes and memoranda. E. L. CORNTHILL.

Discussion on the preceding paper. CHARLES W. HOWELL.

Reminiscences and experiences of early engineering operations on railroads, with especial reference to steep inclines.

No. 1, W. MILNOR ROBERTS.

No. 2, WILLIAM J. MCALPINE.

Resistances on Railway Curves. S. WHINERY.

Notes on the papers in reference to Incline Planes and Resistances on Railway Curves.

— OCTAVE CHANUTE.

Agricultural Drainage. ED. N. KIRK TALLCOTT.

A graphic method of representing railroad accounts. CHARLES LATIMER.

Science, old and new. Its relation to Engineering. W. MILNOR ROBERTS.

The Mississippi River. — B. M. HARROD.

Brick Arches for Large Sewers. R. HERING.

Improvement of Galveston Harbor (2d Paper). CHARLES W. HOWELL.

The Flow of Water in Pipes. CHARLES G. DARRACH.

The proper arrangement and ventilation of house drains. CHARLES E. FOWLER.

On a newly discovered relation between the tenacity of metals and their resistance to torsion. R. H. THURSTON.

On Gauging Streams. CLEMENS HERSCHEL.

Members of the Society are earnestly requested to furnish information or memoranda upon any of the subjects referred to. They are also invited and expected to take part in the discussions either in person or by sending to the Secretary notes for presentation.

In either case, it will assist the Committee in arranging the details for sessions of the Convention, if Members expecting to take part in the discussions will notify the Secretary at once to that effect.

Reports will be expected, as follows :

From Committees on Gauging of Streams, J. James R. Croes, Chairman ; Permanent Quarters for the Society, John Bogart, Chairman ; Resistances of Railway Trains, William P. Shinn, Chairman ; Uniform Accounts and Returns of Railroad Companies, William P.

Shinn, Chairman; Tests of American Iron and Steel, W. Sooy Smith, Chairman; On Exhibit at the Paris Exposition, Geo. S. Morrison, Chairman; The Centennial Commission of the Society, Theodore G. Ellis, Chairman.

Members who intend to be present at the Convention are requested to immediately notify the Secretary to that effect, either upon the blanks already sent out or otherwise.

Transportation for Members has been already secured over many lines, and it is hoped will be obtained over others. Notice of what can be furnished will be sent to Members expecting to visit the Convention.

The Boston Society of Civil Engineers; the Engineers' Club of the Northwest, of Chicago; the Engineers' Club of St. Louis; the Engineers' Club of Philadelphia, and the New Haven Engineering Society, have been invited to attend the Convention. The Local Committee has made arrangements for Members at reduced rates (\$3.50 per day) at the Hotel Brunswick, on Boylston street, which is opposite the place of meeting of the Convention.

Invitation to visit the works of interest at and in the vicinity of Fall river is extended to all visitors to the Convention, by Mr. Wm. Rotch, Chief Engineer of the Fall River Water Works, and Member of the Society. Among these works are an iron bridge for railroad and highway over the Taunton river; the water works of the City, and some of the forty cotton mills, which, together, contain 1 250 000 spindles. These works can be visited either before or after the Convention.

Arrangements have been made for the trip from New York to Boston and return, by Sound steamers, at \$3.00 the round trip, not including stateroom. Most of the members purpose leaving New York on Monday evening, June 17th.

Notify the Secretary at once if you desire a berth reserved for you in stateroom.

DISCORDANT STANDARDS OF MEASUREMENT.
—A number of members of the Society desire to obtain for publication, statements of the various discordant standards of measure in use in the United States. It is known that in many cities the old standards are more or less at variance with the present, and that, quite frequently, confusion and annoyance are the result. A table, compiled from the information which is undoubtedly in the possession of members of the Society, would be both interesting and valuable. The request is, therefore, made, that any information which would be of assistance in the preparation of such a table be forwarded to the Sec-

retary. The replies should state the equivalent of the measures referred to in U. S. standard feet or in meters, together with any additional notes which may be applicable. If provisional equivalents, afterwards proving incorrect, have been adopted, the value of these should also be stated.

IN THE TRANSACTIONS of the Society of Engineers and Architects of Hanover, Vol. XXIV., No. 2, 1878, there is an abstract of the Paper by John T. Fanning, member of this Society, entitled "A Water Conduit under Pressure," which was published as Paper No. CXXXVI., Transactions, Vol. VI., page 69, March, 1877.

MEMBERS of the Society who expect to visit Europe during the present year, are requested to inform the Secretary as soon as possible of that fact, and also of the time when they purpose leaving and the probable length of their stay abroad, together with their European address.

MEMBERS who desire to secure complete sets of the Transactions of the Society are requested to send to the Secretary a list of the papers which are needed to fill up their sets. Some of the earlier papers are out of print. If orders are received for a sufficient number to warrant the expense, a reprint will be made.

The following resolution was adopted at the Ninth Annual Convention of the Society and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, That Members be requested, in papers hereafter presented to the Society to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

THE Library and Conversation Rooms will also, for the present, be open every Thursday evening, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

 ADDITIONS.

MEMBERS.

		Date of Election.
FORCE, C. G., JR.....	City Civil Engineer's Office, Cleve-	
	land, Ohio.....	Feb. 6, 1878.
GREENE, B. H.....	Chief Engineer, New Orleans Pacific	
	Ry., New Orleans, La.....	May 1, 1878.

CHANGES AND CORRECTIONS.

MEMBERS.

DICKINSON, P. P.....	35 Coal and Iron Exchange, New York.
EVANS, WALTON W.....	66½ Pine Street, New York.
GREENE, DAVID M.....	Troy, N. Y.
LANE, MOSES... ..	1616 Grand Ave., Milwaukee, Wis.
OWEN, JAMES.....	Civil Engineer, 748 Broad Street, Newark, N. J.

JUNIORS.

MACY, ARTHUR.....	26 Cedar Street, New York.
RAYMOND, CHARLES W.....	Dept. of Docks, foot of Barrow Street, New York.

ASSOCIATE.

HARRIS, CHARLES M.....	(Care Am. Soc. Civil Engs.), New York.
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FELLOW.

FLINT, CHARLES R... ..	87 Wall Street, New York.
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RESIGNED.

MILLER, J. IMBRIE.....	Member	May 7, 1878.
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV, April, 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MAY 1ST, 1878.—The Society met at 8 P. M. Past President William J. McAlpine in the chair.

The Committee on the Exhibit at Paris, reported progress.

A paper entitled "Reminiscences and experiences of early engineering operations on railroads, with especial reference to steep inclines," by W. Milnor Roberts, was read by the Secretary. This paper and the one read at last meeting upon the "Incline at Madison, Indiana," were discussed by Messrs. Bogart, Chanute, Emery, Forney, W. J. McAlpine, North and W. H. Paine.

The ballot upon admission to membership was canvassed, and the following were declared elected as Members of the Society; Benjamin H. Greene, of New Orleans, La.; Samuel L. James, of New Orleans, La.; and George B. Nicholson, of Cincinnati, O.

MAY 15TH, 1878.—The Society met at 8 P. M., Vice-President Roberts in the chair.

A paper entitled "On the Theoretical Resistances of Railroad Curves," by Samuel Whinery, was read by the Secretary, and the subject discussed by Messrs. Crosby, Emery, C. L. McAlpine, North, W. H. Paine, Searles and Yardley. The discussion being unfinished, was adjourned till the next meeting.

JUNE 5TH, 1878.—The Society met at 8 P. M., Vice-President Roberts in the chair.

Ballots for admission to Membership were canvassed, and the following were declared elected :—

As Members, William J. Nicolls, of New York, and Thomas Rodd, of Pittsburgh, Pa.

As Associate, Edward R. Andrews, of Boston, Mass.

The Secretary reported arrangements in progress for the Tenth Annual Convention.

Drawings and descriptions of a bridge erected in Holland over the Hollandsch Diep, presented by Mr. Walton W. Evans, were laid before the Society.

The proposed amendment to the Constitution, printed at page 28, Proceedings, Vol. IV, *ante*, was offered for the consideration of the Society, by Edward P. North, and seconded by M. N. Forney, and on motion, it was ordered printed and sent out before the meeting of Convention.

The proposed amendment to the By-Laws, printed at page 28, Proceedings Vol. IV., *ante*, was presented by F. Collingwood, on whose motion, seconded by Wilson Crosby, it was ordered printed, and sent out, with the announcement that it would be moved at the Convention.

The discussion on the subject of Resistances on Railway Curves was then resumed, and continued by Messrs. Chanute, Collingwood, Emery, A. Fink, Forney, North, W. H. Paine, Searles and Worthen.

JUNE 19TH, 1878.—Business meeting at the 10th Annual Convention in Boston. The Society met at 8½ P. M., in business session, Vice-President Roberts in the chair.

The proposed amendment to the Constitution, printed at page 28, Proceedings, Vol. IV., *ante*, was discussed by Messrs. North, J. D. Steele, Bogart, George S. Greene, Herschel, Philbrick, Holley, Flagg, Croes, Joseph P. Davis, Latimer, Collingwood and Emery.

This amendment, under the rule, will be again presented at the next annual meeting.

The proposed amendment to the By-Laws, printed at page 28, Proceedings, Vol. IV., *ante*, was then presented, and discussed by Messrs. Collingwood, Croes, George S. Greene, Bogart, Morison, Philbrick, Brooks and Holley.

The amendment was then withdrawn, and the following resolution, offered by J. J. R. Croes, and seconded by F. Collingwood, was passed :

Resolved, That a committee of three be appointed by the presiding officer to examine into the methods of election of officers adopted by various clubs and societies, and report to the Society a By-Law embodying such features of the various plans as may seem best adapted for this Society.

Under this resolution the following committee was appointed :

J. J. R. Croes, E. S. Philbrick and F. Collingwood.

The business meeting of the Society then adjourned, and the session of the Convention was resumed.

TENTH ANNUAL CONVENTION OF THE SOCIETY.

FIRST SESSION.—The Tenth Annual Convention was held at Boston beginning Tuesday, June 18th, 1878. The Society met at the Hall of the Massachusetts Institute of Technology, Boylston street, which had been kindly offered for its use. The secretary, John Bogart, called the Convention to order at 10 A. M., and stated that the President, E. S. Chesbrough had fully expected to be present but that a pressure of public duties in Chicago made his absence from that city impossible at this time, to his great regret. Under these circumstances it would devolve upon the Senior Vice-President, W. Milnor Roberts, to open the Convention, after a record of the members present had been obtained.

The roll was then called and the following members and guests were found in attendance :

Members of the Society—S. T. Abert, Washington, D. C.; C. F. Allen, E. R. Andrews, F. W. Bacon, F. Brooks, E. W. Bowditch, Boston; W. S. Barbour, Cambridgeport; A. D. Briggs, Springfield; H. Bissell, Salem, Mass.; J. W. Bacon, Danbury, Conn.; W. D. Bullock, Pawtucket, R. I.; John Bogart, New York; P. Barnes, Plainfield, N. J.; C. E. Billin, G. Burnham, Jr., Philadelphia; A. Bonzano, Phoenixville, Pa.; D. W. Cunningham, Boston; I. E. Clark, Cambridge, J. G. Chase, Cambridgeport; O. E. Cushing, Lowell; W. R. Curtis, Rockland, Mass.; J. P. Cotton, Newport, R. I.; F. Collingwood, J. J. R. Croes, New York; M. Coryell, Lambertville, N. J.; T. C. Clarke, Philadelphia; F. W. Clarke, Chicago; W. B. Cogswell, Mine La Motte, Mo.; E. L. Corthell, New Orleans; J. P. Davis, Boston; C. G. Darrach, Philadelphia; E. A. Doane, Meadville, Pa.; S. C. Ellis, Boston; J. E. Early, College Hill; C. D. Elliott, Somerville, Mass.; T. G. Ellis, Hartford; M. T. Endicott, New London, Conn.; C. E. Emery, New York; R. Fletcher, Hanover; J. T. Fanning, Manchester, N. H.; E. A. Flint, A. Fteley, Boston; J. B. Francis, Lowell, Mass.; C. Fisher, Trenton, N. J.; J. F. Flagg, Meadville, Pa.; R. Fink, Alexandria, Va.; C. G. Force, Cleveland, O.; S. M. Gray, Providence, R. I.; J. P. Gould, Rondout, N. Y.; G. S. Greene, G. S. Greene, Jr., New York; G. C. Gardner, Altoona, Pa.; P. Golay, Cincinnati, O.; W. A. Haven, Brattleboro, Vt.; A. S. Hardy, Hanover, N. H.; C. Herschel, Boston; J. H. Harlow, Lowell, Mass.; A. B. Hill, New Haven, Conn.; W. G. Hamilton, A. L. Holley, New York; R. Hering, Philadelphia; J. W. Hill, Hamilton, O.; M. Hjortberg, Chicago; T. S. Hardee, New Orleans; G. A. Kimball, Somerville, Mass.; G. O. Knapp, Hartford, Conn.; W. E. Kelley, New Brunswick, N. J.; L. H. Knapp, Buffalo, N. Y.; John Kennedy, Montreal; J. C. Kennedy, Ontario, Canada; C. Latimer, Cleveland, O.; W. H. Lotz, Chicago; M. Lane, Milwaukee; G. P. Low, Jr., Boston; E. D. Leavitt, Jr., Cambridgeport, Mass.; D. J. Lucas, Warren, Pa.; T. D. Lovett, Winton Place, Ohio; A. Macy, Geo. S. Morison, New York;

C. C. Martin, Brooklyn; D. N. Melvin, Staten Island, N. Y.; H. G. Morris, Philadelphia; D. E. McComb, Washington; B. F. Morse, Cleveland, O.; G. H. Norman, Boston; E. P. North, New York; J. O. Osgood, Milton, Mass.; L. F. Olney, Buffalo, N. Y.; E. S. Philbrick, Boston; L. W. Post, Jersey City; P. A. Peterson, Montreal; W. Rotch, Fall River, Mass.; W. Milnor Roberts, New York; R. L. Read, Cincinnati, O.; W. H. Searles, New York; A. Spielman, Hoboken, N. J.; D. McN. Stauffer, Philadelphia; J. D. Steele, Pottstown; W. P. Shinn, Pittsburgh, Pa.; E. T. Scovill, Cleveland, O.; R. H. Thurston, Hoboken, N. J.; E. N. K. Talcott, Morgan Park, Ill.; J. Veazie, H. W. Wightman, H. F. Walling, W. H. White, F. O. Whitney, Boston; J. Whitney, Cambridge; N. H. Whitten, Holyoke, Mass.; F. W. Whitlock, W. H. Wiley, New York; De V. Wood, Hoboken, N. J.; Geo. Y. Wisner, Detroit; T. J. Whitman, St. Louis.

Visiting Engineers.—E. Appleton, T. Appleton, C. D. Austin, D. Brackett, F. H. Barrett, W. H. Bradley, G. W. Blodgett, J. E. Cheney, J. R. Carr, Jr., Jos. H. Curtis, Geo. H. Crafts, E. C. Clarke, F. L. Fuller, F. D. Fisher, D. Fitzgerald, O. Hodges, E. W. Howe, C. W. Kettell, W. H. Lemon, W. F. Learned, C. W. Lunt, F. A. May, J. D. Mason, H. Manley, G. S. Rice, L. F. Rice, R. H. Richards, W. Shepard, F. C. Tucker, I. S. P. Weeks, C. Whitaker, Boston; C. W. Folsom, Cambridge; Geo. R. Hardy, Springfield; * C. Pfeifer, F. H. Pond, Chas. A. Smith, St. Louis; † T. C. Bradley, Geo. H. Frost, A. Wolcott, Chicago; ‡ C. A. Ashburner, W. Burnham, G. R. Buckman, C. Constable, W. A. Cooper, G. H. Christian, J. B. Knight, H. C. Lewis, T. J. Lewis, W. Lewis, A. E. Lehman, T. C. McCollom, L. C. Madeira, J. T. Morris, P. Roberts, Jr., C. Sellers, Jr., H. Sellers, F. W. Taylor, Philadelphia; § J. P. Henck, A. G. Hills, A. P. Rockwell, Boston; A. W. Hunking, Lowell; D. H. Johnson, Salem, Mass.; C. A. Ferry, New Haven, Conn.; W. H. McFadden, W. M. McFadden, Philadelphia; R. H. Soule, Altoona, Pa.; J. P. Rockwell, Denison, Texas.

Vice-President Roberts then made an introductory address,|| and announced that in accordance with the rules, a presiding officer would be chosen by the Convention.

Edward S. Philbrick, of Boston, was chosen to preside at the Convention, and John Bogart to act as Secretary.

In taking the chair, Mr. Philbrick said:

I thank you for the unexpected honor which you have conferred upon me this morning; and before calling your attention to the business in hand, I can only say, that when the circular was first sent to me by your secretary, asking me to vote where the Convention should meet, I did not vote for Boston, because I felt a degree of diffidence—that we might

* Members Boston Society Civil Engineers. † Members Engineers' Club of St. Louis
‡ Members Engineers' Club of the North West. § Members Engineers' Club of Philadelphia.
|| This address will be hereafter published.

not be able to present to the Society those objects of interest which have been presented to us in other cities. But, as the Society has done us the honor to come here, I can certainly extend to you the hand of fellowship, which is about all we can do, and give you a most hearty welcome to the old City of Massachusetts. There is not much that we can do in the way of professional entertainment. We hope to spend a few afternoons in seeing some of the objects most worthy of interest in the neighborhood of Boston and the cities of Lowell and Lawrence, which are among the great manufacturing centres of New England, and which have been rather typical cities in that respect, being prominent in introducing the cotton manufacture into the United States, and building it up; and there also, perhaps, you will find subjects a little more akin to our profession in the apparatus which has been devised for gauging the flow of water, a subject which, of course, interests a large part of our profession who have devoted themselves to that speciality.

But our time is limited, gentlemen, and I will now call your attention to the business for which we are here assembled. As we are, I hope, a law-abiding body, I would call upon the Secretary to read the general rules by which our conventions are governed.

The rules were then read.*

The subject of Bridges was announced.

The following papers were considered :

CXL. Approximate determination of stresses in the Eye-Bar Head. William H. Burr.

CXLVII. Proportion of Eye-Bar Heads and Pins as determined by experiment. C. Shaler Smith.

The subject was discussed by De Volson Wood.†

The following paper was considered :

CLVI. A new method of detecting overstrain in iron and other metals, and its application in the investigation of the causes of accidents to bridges and other constructions. Robert H. Thurston.

A paper,† by R. H. Thurston, entitled "On a newly discovered relation between the tenacity of metals and their resistance to torsion," was then read by the Secretary.

A description of the recent accident to a strand of the Brooklyn Bridge‡ was then given by Francis Collingwood, and discussed by Messrs. Wood, Croes and Emery.

The following papers were considered :

CXLIV and CXLIX. Relative quantities of material in bridges of different kinds, of various heights. Charles E. Emery.

The subject was discussed‡ by Messrs. Searles and Emery.

The subject of Rivers and Harbors was then taken up. A paper, by E. L. Corthell, entitled "The South Pass Jetties, descriptive and incidental notes and memoranda,"† was read by the author.

* The rule limiting the time of reading for each paper and of each member taking part in the discussions to ten minutes, except by unanimous consent, was enforced during the whole session of the Convention.

† To be hereafter published.

A discussion of this paper by C. W. Howell* was read by the Secretary.

The subject was also discussed by W. Milnor Roberts.*

A communication was read from the President of the Massachusetts Institute of Technology, inviting the members of the Society to inspect the several departments of the institute, which was accepted. A communication from the Boston Board of Trade, inviting the members of the Society to avail themselves of the facilities of the Merchants' Exchange and Reading Room, was read and accepted. Announcements were made of arrangements for the afternoon excursions. The Convention adjourned to 7½ P. M.

SECOND SESSION.—The Convention resumed its session at 7½ P. M.

The consideration of the subject of rivers and harbors was continued and discussed by J. Foster Flagg.*

A paper,* by B. M. Harrod, entitled "The dangers threatening the navigation of the Mississippi River and the reclamation of its alluvial lands," was read by the Secretary.

The subject was discussed* by Messrs. T. S. Hardee, E. L. Corthell, W. Milnor Roberts, John Kennedy, and J. Foster Flagg.

The following papers were then considered :

CXLIII. Improvement of entrance to Galveston harbor. Charles W. Howell.

CLV. The Improvement of the South Boston Flats. Edward S. Philbrick.

— Discussion on Levees as a system for reclaiming low lands. J. Foster Flagg. Vol. VI., page 305.

Some explanations as to the improvements in Boston harbor were given by E. S. Philbrick, and it was stated that as one of the excursions of the Society was to be down the harbor and past these improvements, full information on the subject would be given on that occasion.

In answer to a question E. P. North gave a description of the means adopted for checking the moving back of the Falls of St. Anthony.*

The Committee on Gauging of Streams then made a report.*

The subject of Gauging Streams was discussed by Clemens Herschel.

The following paper was then considered :

CXLV. The flow of water in open channels. Theodore G. Ellis.

Remarks* upon the subject were made by Messrs. J. B. Francis, T. G. Ellis, W. M. Roberts, C. E. Emery, C. Herschel, and De Volson Wood, and it was discussed by Messrs. White, J. P. Davis, Latimer and Walling.

A paper, by Charles G. Darrach, entitled "The Flow of Water in Pipes,"* was read by the author.

Remarks upon the subject* were made by John T. Fanning.

* To be hereafter published.

A letter was read from S. N. Gray, member of the Society, City Engineer of Providence, inviting the members of the Society to visit that City on their return from Boston, which invitation was accepted.

The Convention then adjourned to Wednesday, June 19th, at 10 A. M.

THIRD SESSION.—The Convention reassembled at 10 A. M., on Wednesday, June 19th. Announcements were made of details of excursions for the afternoon.

The subject of cements was announced.

The following paper was considered :

CLII. "Notes and experiments on the use and testing of Portland Cement." William W. Maclay.

A discussion* on the subject by Don J. Whittemore was read by the Secretary.

The subject was also discussed by Francis Collingwood.*

J. Dutton Steele offered the following resolution :

Resolved, That the members present have listened with much interest to the paper read by E. L. Corthell upon the jetty improvements at the mouth of the Mississippi ; and that while we may differ individually as to the precise effects they are to produce, we are in hearty sympathy with the undertaking, and fully appreciate the importance in a national and commercial point of view of thus improving the outlets of our great rivers.

This resolution was discussed by Messrs. J. D. Steele, T. G. Ellis, Roberts, Latimer, and Herschel.

On motion this resolution was laid on the table.

C. Herschell offered the following resolution :

Resolved, That this Society of Civil Engineers, in convention assembled, is heartily glad to hear that there is a twenty-four feet channel at the mouth of the Mississippi river to-day, and that they hope that Capt. Eads will secure thirty feet.

This resolution was discussed by Messrs. J. B. Francis, Latimer, North, J. D. Steele, D. V. Wood, and Collingwood.

C. Latimer moved that a committee of three be appointed to frame a resolution on the subject.

On motion of J. B. Francis, the whole subject was indefinitely postponed.

The subject of masonry was announced.

A paper* by R. Hering, entitled "Brick arches for large sewers," was read by the author.

W. Milnor Roberts made remarks* upon the subject, and it was discussed by Messrs. Collingwood, Hering and Morison.

A communication* on the same subject from E. S. Chesbrough was read by the Secretary.

The topic of cements was resumed, and remarks* upon the subject were made by W. P. Shinn.

* To be hereafter published.

The topic of masonry was resumed, and the following paper considered :

CLI. Nomenclature of Building stones and stone Masonry. J. James R. Croes, William E. Merrill, and Edgar B. Van Winkle.

Remarks upon the subject* were made by J. Foster Flagg, and it was discussed by Messrs. Croes, Collingwood and Veazie.

The topic of hydraulics was resumed.

A paper* by James B. Francis, entitled "The rain fall during a storm in October, 1869," was read by the author.

The topic of dams was announced.

The following paper was considered :

CLVIII. Wing Dams in the Mississippi above the Falls of St. Anthony. Edward P. North.

Remarks* upon the subject were made by T. G. Ellis and E. P. North.

The convention then proceeded to the business prescribed by the following clause of the By-Laws† which was read.

"At the Annual Convention a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention."

The following resolution was offered by George S. Greene, and lost :

Resolved, That a Committee of three be appointed by the chair to hand in the names of five persons to be proposed to the Convention for the nominating committee, under the By-Laws, and that the names of the five persons shall be from the geographical divisions of the country."

The method of nominating the Committee was discussed by Messrs. George S. Greene, Gardner, Emery, T. G. Ellis, Bogart, Scarles, De Volson Wood, Croes and others.

The following resolution offered by De Volson Wood was adopted :

Resolved, That the Convention nominate the committee, and as far as possible it be geographically divided.

The convention then adjourned to 7½ P. M.

FOURTH SESSION.—The Convention reassembled at 7½ P. M.

The following resolution, offered by G. C. Gardner, was adopted :

Resolved, That the members of the Nominating Committee be selected from the following districts of the country : New York and the Atlantic coast, Pittsburgh and the Ohio valley, Chicago and the Lake region, St. Louis and the Mississippi valley, New Orleans and the South.

Nominations were then made, and the following named members were appointed by the Convention as the Nominating Committee :

George S. Morison, of New York.

William P. Shinn, of Pittsburgh.

M. Hjortsberg, of Chicago.

James B. Eads, of St. Louis.

Thomas S. Hardee, of New Orleans.

* To be hereafter published. † Proceedings, Vol. III, p. 26.

The Committee on Resistances of Railway Trains reported,* through its chairman, W. P. Shinn.

On motion, the committee was continued.

A paper*, by Richard H. Buel, on the subject of the Dynograph, was then presented.

The Committee on Uniform Accounts and Returns of Railroad Companies reported,* through its chairman, W. P. Shinn.

On motion, the committee was continued.

A paper,* by Charles Latimer, upon the subject of the Graphic Representation of Railroad Accounts, was then read by the author, and illustrated by a large chart.

The report of the Committee on Permanent Quarters for the Society,* was presented by F. Collingwood, member of the committee.

On motion, the committee was continued.

The report of the Committee on Tests of American Iron and Steel,* forwarded by its chairman, W. Sooy Smith, was read.

On motion, the committee was continued.

The report of the Committee on the Exhibition of American Engineering at the Paris Exposition of 1878,† was presented by its chairman, George S. Morison.

A statement of the work done by the committee, the exhibits secured, and the expenses and receipts to the present time was made, on behalf of the committee, by George S. Morison, chairman, and illustrated by a model of the structure erected for the purpose of securing the largest amount of wall surface on the floor area allotted to the Society, together with sufficient space for the exhibit of models, portfolios, etc.

Remarks were then made by T. C. Clarke, who had just returned from Paris, in reference to the interest felt abroad in American Engineering, which was first developed by the Exposition at Philadelphia, and which it was hoped would be strengthened by this exhibit.

The subject was discussed by Messrs. J. D. Steele, Latimer, Bogart, Herschel, and others.

On motion of J. Dutton Steele, it was ordered that the Committee on the Exhibit at Paris be requested to prepare a subscription paper to be presented to the members present at the Convention, and also sent by mail to all members of the Society.

The Centennial Commission of the Society presented a report,* through its chairman, T. G. Ellis,

On motion the Commission was continued.

The question of the time and place for the next Annual Convention was then considered.

An invitation to hold the Convention at St. Louis was extended to the Society, through T. J. Whitman, of St. Louis.

* To be hereafter published. † This report has been printed and sent to members.

The Convention adjourned till the close of the business session of the Society, which was then held.

FIFTH SESSION.—At the close of the business meeting of the Society, the Convention resumed session.

The topic Steam Engines was called up. The following paper was considered :

CLVII. Steam engine economy; A uniform basis for comparison. Charles E. Emery.

The subject was discussed by Messrs. Leavitt, Flagg, Emery and Whitaker.

Under the topic Hydraulics, the following paper was considered :

CXXXIX. The Consumption and Waste of Water delivered by Public Works. James H. Harlow.

The topic Mines and Blasting was called up, and the following papers referred to :

CXLII. On the simultaneous ignition of thousands of mines and the most advantageous grouping of fuses. Julius H. Striedinger.

CLII. On igniting blasts by means of electricity. Julius H. Striedinger.

The author of these papers being absent in Europe, their discussion was postponed.

The subject of Preservation of Timber was referred to as having been exemplified on one of the excursions made to the works in South Boston.

The topic of Railroads was announced, and the following papers considered :

CLVIII. Construction and operation of the Incline Plane Railroad at Madison., Ind. M. J. Becker.

CLIX. Resistances on Railway Curves. S. Whinery.

— Notes on the papers in reference to Incline Planes and Resistances on Railway Curves. Octave Chanute.

— Reminiscences and experiences of early engineering operations on railroads, with especial reference to steep inclines. W. Milnor Roberts.

Notes* on the question of elevation of the outer rail on curves by E. Yardley were read by the Secretary, and discussed by Messrs. J. D. Steele, Philbrick, Roberts and Latimer.

The subject of Surveys was announced.

The following papers were considered :

CXXXVIII. Co-ordinate Surveying. Henry F. Walling.

CXLVI. A novel railroad survey. Thomas S. Hardee.

CL. Description of survey for determining the slope of water surface in the Erie Canal. William H. Searles.

The latter paper was discussed by Messrs. Roberts and Croes.

After announcing the arrangements for excursions during the succeeding days of the week, that for the following day being down the Harbor of Boston and as far as Minot's Ledge Light House, E. S. Philbrick, by request, gave a description of the old light house at that point and its destruction.

* To be hereafter published.

The following resolutions were passed ;

"Resolved, that this Convention desires to express its hearty appreciation of, and thanks for, the great kindness and many favors extended to the members and guests of the Society by the Boston Society of Civil Engineers during the session of the Convention."

"Resolved, that the thanks of the Society be conveyed to the members of the local committees for the very thorough manner in which their duties have been performed, and to the Boston Board of Trade, the officers of the Massachusetts Institute of Technology and to the officers of the railroads which have courteously afforded to the members of the Convention facilities for transportation and for examining the works of interest in the vicinity of Boston."

"Resolved, that the thanks of this Convention be extended to Mr. Edward S. Philbrick for the able and courteous manner in which he has presided over its deliberations."

The Convention then adjourned.

The section of the By-Laws providing for conventions reads as follows : "A convention of the Society for professional discussion and social intercourse shall be held annually, at such place as the Society may determine," * * * &c.

In addition to the sessions for professional discussions, as above reported, provision was made by the local committees at Boston for excursions and visits to many points of interest. Nearly all the members of the Society and their guests who attended the convention took part in these excursions, which, through the excellent arrangements characterizing them, added largely to the pleasure of the occasion, both in the interesting engineering works visited and in the opportunities afforded for social intercourse. Members of the families of many of the engineers also accompanied them in these excursions, and appreciated the courtesy which included them in the invitations.

The members of the Boston Local Committees were as follows :

Working Committee—Henry M. Wightman, Chairman, Edward S. Philbrick, Henry F. Walling, Joseph Veazie, Frederick Brooks, and Clemens Herschel, Secretary and Treasurer.

Advisory Committee—James B. Francis, George A. Parker, George H. Norman, Jos. P. Davis, George S. Morison, and O. E. Cushing.

The general programme for each day was arranged and adhered to. It was printed in a handsome pocket pamphlet, interleaved. It is here-with given.

TUESDAY, JUNE 18TH, Boston Society of Civil Engineers Day. The headquarters of the Society will be at the Hotel Brunswick, on Boylston street, corner of Clarendon. The meetings of the Society will be held at the Massachusetts Institute of Technology, opposite the hotel, in

rooms kindly placed at the disposal of the Society by the officers of the Institute.

The Local Committee on Convention request each member to call at the rooms of the committee, in the hotel, soon after his arrival, and signify which of the excursions he proposes to join, and whether he will attend the convention dinner, so that the committee, being duly instructed, may be able properly to attend to the comfort of all.

The Convention will be called to order at 10 A. M., session, adjournment, dinner. In the afternoon, by invitation of the Boston Society of Civil Engineers, an excursion will be made by rail to Newton Upper Falls, Aqueduct Bridge, Boston Water Works, and return in coaches through some of the suburbs of Boston,

The Committee of the Boston Society having this excursion in charge consists of: William H. Bradley (Supt. of Sewers of the city of Boston), Chairman and manager of the excursion; Edward Sawyer, Engineer of the Newton Water Works; George S. Rice, Secretary Boston Society of Civil Engineers; Desmond Fitzgerald, Supt. Western Division Boston Water Works; C. W. Kettelle, Civil Engineer.

Members of the Convention going on this excursion will leave the hotel at 2.20 P. M. Special cars, provided by the courtesy of the N. Y. & N. E. Railroad Company (C. P. Clark, General Manager), will be found in waiting under the Columbus avenue bridge. These cars will be attached to the train leaving the Albany depot at 2.30 P. M., and this train is due at Newton Upper Falls at 3.07 P. M. A map, showing the route of the return to Boston, and pointing out objects of interest on the way, will be given to each member. The excursion will return to the hotel in time for supper and the evening session, at 7.30 P. M.

WEDNESDAY, JUNE 19TH.—Boston Day. Mr. H. M. Wightman, Manager of the Day. The Convention will be called to order at 10 A. M. Session.—Adjournment.—Dinner. In the afternoon the Convention will divide into parties, each member electing which he will join. The following excursions have been provided for this afternoon: 1.—To Harvard College and Mount Auburn Cemetery, in charge of Mr. Frederick Brooks, A. B. (Harvard). 2.—To the Art Museum, Natural History Building, Trinity Church, and elsewhere about the City as the party may desire. In charge of Messrs. E. S. Philbrick and H. F. Walling. 3.—To the work on the new system of sewerage, now in progress. In charge of Messrs. E. C. Clarke, Principal Assistant Engineer, and Geo. S. Rice, Division Engineer, engaged upon the work. 4.—To Bunker Hill (by invitation of Hon. Richard Frothingham, President Bunker Hill Monument Association), and to the Navy Yard. In charge of Messrs. Clemens Herschel and Joseph Veazie. It is expected that Mr. Frothingham will meet the party at the Monument grounds. 5.—To the Brighton Abattoir and the Watertown Arsenal. In charge of Mr. H. M. Wightman, Assistant City Engineer. 6.—To the Creosoting Works at South Boston; Mr. E. R. Andrews, Proprietor. In charge of that

gentleman. Members of the Convention going upon one of these excursions will report to the gentleman having the same in charge, in the parlor of the hotel assigned the Convention. Coaches are provided as transportation for those excursions not readily made by the public conveyances. The coaches will start from the hotel at 2:30 P. M. Members especially interested in the construction of dams for storage reservoirs, who may wish to see the dams now building at Framingham, 25 miles out from the City, will report to Mr. G. P. Low, Jr., Assistant Engineer, engaged upon the work, who will guide the party to Framingham and to the Reservoir dams. The train for Framingham will leave the Albany depot at 2:15 P. M. Session and business meeting at 7:30 P. M.

THURSDAY, JUNE 20TH.—Harbor Day. Mr. E. S. Philbrick, Manager of the Day. By invitation of the Boston Board of Trade, John W. Candler, President, an excursion will be made in the Upper and Lower Harbors, including a lunch on board the *Bohemian*, of the Leyland line of Liverpool steamers, Thayer & Lincoln, Agents; and a visit to Fort Warren, &c., as detailed below. The Committee of the Boston Board of Trade, tendering this excursion to the Convention, consists of John W. Candler, Chairman; Alpheus H. Hardy, Henry F. Woods, Curtis Guild, William H. Lincoln, Charles M. Clapp, and Rufus S. Frost, and the excursion will be made on the city steamer, *J. Putnam Bradlee*, kindly tendered through the Board of Trade by the City of Boston, Hon. Henry L. Pierce, Mayor. Members of the Convention going upon this excursion, may take coaches leaving the hotel at 9:30 A. M., for Eastern Avenue wharf (next south of South Ferry to East Boston). The boat leaves at 10 A. M., passing in front of Navy Yard, will enter mouth of Mystic River, and see the Lowell Railroad improvements; will then visit the improvements of the South Boston flats. (See Transactions of the Society, No. CLV.) A landing will here be made. Cross Upper Harbor to Grand Junction wharves, land, inspect railroad facilities and elevator; lunch on British steamer *Bohemian*. The route after lunch will be governed somewhat by the state of the weather. If this should be suitable for going outside, the steamer will proceed to Fort Warren, Col. John Mendenhall, United States Artillery, commanding, where a landing will be made for inspection of the Fort, after which the party will approach Minot's ledge lighthouse,* and return through Hull gut, Weir river and Quincy Bay to the City. If the weather should be unfavorable for going outside, the party will land at Deer Island,* and inspect the public institutions there, before landing at Fort Warren, and return thence via Hingham Bay, as above.

Schedule of time: Leave wharf, 10 A. M., arrive at South Boston 10:30. Leave South Boston, 11:30 A. M., arrive at East Boston, 11:45. Leave East Boston, 1:30 P. M., arrive at Boston on the return about 5 P. M. The steamer's whistle will be sounded five minutes before leaving

*The weather being favorable, both the trip to Minot's ledge and the visit to Deer Island were made.

each landing. In the evening at 7:30, the Annual Dinner will take place at the Hotel Brunswick.

FRIDAY, JUNE 21ST.—Lowell and Lawrence Day. Mr. James B. Francis, Agent and Engineer of the "Proprietors of Locks and Canals on Merrimack River," Manager during the stay of the party at Lowell. Mr. E. D. Leavitt, Jr., Mechanical Engineer, Manager during the stay of the party at Lawrence. By invitation of Mr. James B. Francis and others, an excursion will be made to Lowell and Lawrence. Members of the Convention going upon this excursion, may take coaches leaving the hotel at 7:30 A. M., for the Lowell Depot. Train leaves at 8:00 A. M. Special cars and transportation will be provided for the members of the Convention by courtesy of the Boston & Lowell and Nashua & Lowell Railroads (Hocum Hosford, General Manager). The train is due in Lowell at 9:00 A. M. Opportunity will be given to inspect some of the cotton, carpet and other mills at Lowell, the system of canals and water power of the Proprietors of Locks and Canals on Merrimack River, the processes of gauging running water; the two Lowell pumping engines, &c., with lunch at the engine-house at 0:30 P. M. The train for Lawrence leaves the Merrimack street depot at 2:00 P. M., being due in Lawrence at 2:35 P. M. Opportunity will be given to inspect the Lawrence pumping engine, the water power of the Essex Company, the Washington (woolen) Mills, &c. The train for Boston leaves the North Lawrence depot at 5:00 P. M., and is due in Boston at 6:04 P. M.

SATURDAY, JUNE 22D.—Mount Washington Railway, and Home. Mr. Geo. S. Morison, Manager of the Day. By the courtesy of the Eastern Railroad Company (Gen. A. P. Rockwell, President), an excursion has been arranged to Mount Washington, returning Monday morning. Members take coaches leaving the hotel at 7:45 A. M. The train leaves the Eastern Railroad Depot at 8:15 A. M., and is due at Fabyan's at 1:40 P. M. Headquarters of the Society at the Fabyan House.

The programme, as printed above, was carried out.

By the kindness of the officers of the Portland & Ogdensburg Railroad, open observation cars were provided at Conway, and full opportunity was thus given for the enjoyment of the scenery through the White Mountain Notch, and for an inspection of the location and construction of that railroad. From the Fabyan House, where dinner was provided, the train was hauled to the foot of the incline, and there, by the courtesy of the Mount Washington Railway Company (Sylvester Marsh, President), three of the incline locomotives, with the peculiar cars which ascend the mountain, were in readiness and took the party to the summit, and, after a short stay, descended the incline. Spending Sunday, either at the Fabyan House or at Crawford's, the majority of the party returned to Boston on Monday. On Tuesday Fall River and Providence were visited, and interesting engineering works at these cities examined.

REPORT OF THE TREASURER,

Receipts and Disbursements, November 7th, 1877, to May 31st, 1878.

RECEIPTS.

Balance from former Treasurer.....	\$634 87
Entrance Fees.....	345 00
Dues.....	5,632 50
Sales of Publications and Diplomas.....	112 98
Interest Norman Medal Fund.....	70 00
do Fellowship Fund.....	280 00
Miscellaneous.....	25 00

Total Receipts.....\$7,100 15

DISBURSEMENTS.

(A) *For liabilities incurred previous to the beginning of the current Society year :*

Publications.....	\$1,440 70
Stationery.....	167 55
Rent.....	400 00
Legal Services.....	160 88
Janitor, House Repairs and Supplies.....	142 04
Postage.....	1 70
Miscellaneous.....	15 25
	<hr/> \$2,328 12

(B) *For liabilities incurred during the present Society year :*

Publications.....	\$1,053 22
Rent.....	800 00
Stationery and Printing.....	249 91
Salaries.....	1,500 00
Postage.....	189 76
Fuel and Light.....	229 89
Annual Meeting.....	105 75
Janitor, House Repairs and Supplies, and Library.....	331 63
Norman Medal and Prize.....	128 15
Telegraph, Express and Contingencies.....	61 57
Safe Deposit and Insurance.....	29 13
	<hr/> \$4,679 01

Total Disbursements.....\$7,007 13

Balance.....98 02

\$7,100 15

The Board of Direction considered it proper to pay first the liabilities incurred during previous years, running back to 1874, which were found to be due at the beginning of this Society year, and which, as shown above, amounted to \$2,328¹¹/₁₀₀.

These payments have reduced the amount available for current expenditure, which would otherwise have been mostly devoted to publications.

The balance transferred from the previous year was also reduced by the payment during the last month of that year, of bills amounting to over \$1,000, which had been incurred during a period extending from December, 1872, to April, 1877.

The Society is now out of debt, excepting perhaps a few bills, not exceeding in amount \$250, which have been presented as incurred previous to the present Society year, and which are now waiting adjustment or explanation.

The funds of the Society are safely invested. Should the receipts from the payments of dues by members equal the average of past years, the publications can soon be brought up to date.

J. J. R. CROES,

Treasurer.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Agriculture, Book of —. A Manual of Agricultural Science, as applied in Practice. W. W. Fyfe. London. Post 8vo. *Stewart*. 1s. 6d.

Architecture. Modern Dwellings in Town and Country, adapted to American Wants and Climate. 100 original designs of cottages, villas and mansions; with Treatise on Furniture and Decoration. H. Hudson Holley. New York. 8vo, illus. *Harpers*. \$4.00.

Architectural Studies in France. 90 lithog. plates (16 colored). W. G. Davis. London. Imp. fol. *Batsford*. 63s.

Centennial Exhibition Reports. Official Reports of the International Board of Judges, Centennial Exhibition, 1876. Edited by Francis A. Walker, Chief of the Bureau of Awards. 8vo, paper. Group I.—Minerals, Mining and Metallurgy, including the Machinery. Illustrated. 494 pp. \$2. Group III.—Chemistry and Pharmacy, including the Apparatus. Illustrated. 292 pp. \$1.50. Group X.—Clothing, Furs, India rubber Goods, Ornaments and Fancy Articles. 112 pp. \$0.75. Group XIV.—Apparatus of Heating, Lighting, Ventilation, Water-Supply and Drainage. Illustrated. 88 pp. \$0.75. Group XVIII.—Railway Plant, Rolling Stock and Apparatus, Road Engines. Profusely illustrated. 94 pp. \$1.25. Group XX.—Motors, Hydraulic and Pneumatic Apparatus etc. Illustrated. 432 pp. \$2. Group XXV.—Instruments of Precision, Research, Experiment and Illustration, including Telegraphy and Music. Illustrated. 210 pp. \$1.00. Group XXVIII.—Education and Science. 392 pp. \$1.75. Group XXIX.—Horticulture. 64 pp. \$0.25. Groups XXX. to XXXV.—Live Stock. 132 pp. \$0.75. Group XXXVI.—Pomology. 50 pp. \$0.25. Collective Exhibits. 40 pp. \$0.25. A complete set of the Judges' Reports. 32 vols. \$20. Philadelphia. *Lippincott*.

Contracts. The doctrines of the law of — in their principal outlines, stated, illustrated, and condensed. J. P. Bishop. St. Louis. 8vo. *Soule & Thomas*. \$3.50.

Drawing; a Treatise on Linear Perspective —, adapted to the Second Grade of the Science and Art Department. 2d ed., enlarged. J. & G. Yule. London. 4to. *Walterston*. 2s. 6d.

Education; The Year Book of — for 1878. Henry Kiddle and Alexander J. Schen. New York. 8vo. *E. Steiger*. \$2.00.

Geometry. A complete Course of Second Grade Practical —, including the Elementary Projection of Solids. With numerous Examination Papers; Drawing Book combined. J. & G. Yule. London. 4to. *Walterston*. 2s. 6d.

Heat; The Analytical Theory of —. Joseph F. urier. Trans. with notes by Alexander Freeman. London. 8vo. *Cambridge Warehouse*. 16s.

Iron, Steel, and Allied Trades in 1877. Annual Report. J. S. Jeans. London. 8vo. *Spens*. 16s.

Light; The Principles of — and Color. Edwin D. Babbitt. New York. 8vo, illus. *Babbitt & Co.*

Logarithms; New Manual of — to seven places of decimals. Dr. Bruhns. London. Royal 8vo. *Low*. 6s.

Machine Construction; Principles of —. Edward Tompkins. Edited by Henry Evers (Collins' Advanced Science Series). Vol. 1. London. 12mo, plates. *Collins*. 3. 6d.

— Construction; Principles of —. Edward Tompkins (Advanced Science Series). Text and Plates. New York. Text, 12mo; plates, 4to. *Putnam*. \$4.50.

Magnetic Variations in the United States: being a compilation of Observations made in America from the year 1640 to the present date. Tabulated and arranged for the

use of surveyors. J. B. Stone. New York. 12mo. *Van Nostrand*. \$1.50.

Museum—South Kensington ——. What it is; how it originated; what it is doing for England and the world. A lecture delivered in Cincinnati, April 5, 1878, by Chas. P. Taft. 8vo. *R. Clarke & Co.* \$0.25.

—South Kensington ——. Free Evening Lectures, delivered in connection with the Special Loan Collection of Scientific Apparatus, 1876. (South Kensington Handbooks). 8vo. London. *Chapman & Hall*. 8s.

Nile, The sources of the Nile. Through the dark Continent, around the great lakes and down the Congo. Henry M. Stanley. London. 2 vols. 8vo, illus. *Low, Marston & Co.* £2 2s.

Paris Exhibition, Official Catalogue of the British Section, Paris Universal International Exhibition, 1878. Published by Direction of the President of the Royal Commission. In two parts. Plans and Elevations. Demy 8vo, ad., pp. lxxxvi—284 and 260. London. *Eyre & Spottiswoode*. 2s. 6d.

Pine Plantations on the sand wastes of France. John Crombie Brown. Edinburgh. 8vo, *Oliver & Boyd*. 7s. 6d.

Ponds. A short practical treatise on dew —, the farmer's summer water suppliers: being invaluable on hilly farms and sheep-runs, self-supporting, need no repair, and always efficient. With two folding plates and diagram. H. P. Slade. London. 8vo, *Spon*, New York. \$0.80.

Railroad Builder. A Handbook for estimating the probable cost of American Railway Construction and Equipment. Wm. J. Nicolls. Pocketbook form. Philadelphia. 18mo. *Henry C. Baird & Co.* (Announcement.)

Railway System, Index to our — and our Leading Lines: a comprehensive Analysis of Railway Property. A handbook for shareholders and investors and all who are

interested in railway administration and management. W. Fleming. London. Roy. 8vo. *M'Corquodale*. 2s. 6d.

Railway Reports, American —; a collection of all reported decisions relating to railways. H. A. Shipman, New York. 8vo. Vol. 9. *Cockcroft & Co.* \$6.

Ready, Reckoner, Merchants —. Arranged expressly for Coal Proprietors, Merchants, Railway Companies, &c. 4th ed. Folio. *Simpkins*. 4s.

Record of Science and Industry, Annual, for 1877. Spencer F. Baird, New York. 12mo. *Harpers*. \$2.

Society of Engineers, Transactions for 1877. Edited by P. S. Nursey, Secretary. London. 8vo. *Spon*. 15s.

Telegraph Cables, Laying and repairing. Capt. V. Haaskler. London. Post 8vo. *Spon*, New York. \$2.

Tramways, their construction and working, embracing a comprehensive history of the system, with an exhaustive analysis of the various modes of traction, including horse power, steam, heated water, and compressed air; a description of the varieties of rolling stock, and ample details of cost and working expenses, with special reference to the tramways of the United Kingdom. With 9 engravings and folding plates. D. Kinnear Clark. London. Post 8vo. *Lockwood*. 18s.

Trigonometry, The elements of Plane —. Eugene L. Richards, New York. 12mo. *Appleton*. \$0.75.

Water Supply, London —: Being an examination of the alleged advantages of the Scheme of the Metropolitan Board of Works, and of the inevitable increase of rates which would be required thereby. By a Civil Engineer. London. 8vo. *Spon*. 6d.

—Tidy's Report on the London Water Supply. London. Small 4to. *Churchill*. 2s. 6d.

ANNOUNCEMENTS.

THE explanation of the delay in issuing the publications of the Society will be found in the report of the Treasurer, printed in this number.

DISCORDANT STANDARDS OF MEASUREMENT.

—A number of members of the Society desire to obtain for publication, statements of the various discordant standards of measure in use in the United States. It is known that in many cities the old standards are more or less at variance with the present, and that, quite frequently, confusion and annoyance are the result. A table, compiled from the information which is undoubtedly in the possession of members of the Society, would be both interesting and valuable. The request is, therefore, made, that any information which would be of assistance in the preparation of such a table be forwarded to the Secretary. The replies should state the equivalent of the measures referred to in U. S.

standard feet or in meters, together with any additional notes which may be applicable. If provisional equivalents, afterwards proving incorrect, have been adopted, the value of these should also be stated.

MEMBERS who desire to secure complete sets of the Transactions of the Society are requested to send to the Secretary a list of the papers which are needed to fill up their sets. Some of the earlier papers are out of print. If orders are received for a sufficient number to warrant the expense, a reprint will be made.

SPECIAL attention is called to the code of rules for award of the Norman Medal, printed at the end of this number. Papers for competition must be submitted previous to September 6th, 1878. All members of the Society are invited to assist in securing the presentation of papers for this award.

MEMBERS of the Society who expect to visit Europe during the present year, are requested to inform the Secretary as soon as possible of that fact, and also of the time when they purpose leaving and the probable length of their stay abroad, together with their European address.

The following resolution was adopted at the Ninth Annual Convention of the Society and ordered printed regularly in the Society publications :

Whereas, the metric system of weights and measures is now extensively used abroad ; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison :

Resolved, That Members be requested, in papers hereafter presented to the Society to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

THE Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

EXHIBITION OF AMERICAN ENGINEERING AT PARIS, 1878.—The Committee appointed by the Society to prepare this Exhibition presented a report at the late Annual Convention, from which the following information is gathered:

The Exhibition may be divided into two classes: 1st. The drawings and photographs of works which have been grouped in departments and are mounted on the structure erected for this purpose, where they may readily be seen and examined by all visitors to the Exposition, together with the models and specimens which are likewise conspicuously displayed. 2d. A collection of tracings, albums, specifications, blank contracts, lithographs and other miscellaneous matter, not designed for general exhibition, but accessible for inspection to engineers and others who may desire to make special investigations.

The structure on which the drawings,

photographs and models are mounted was built for your Committee by Messrs. Mead & Taft, of Cornwall-on-the-Hudson, and taken to France by one of the Government vessels. All parts except the interior frame, which is concealed by the drawings, are of American hard woods. It is an excellent example of first-class machine-made carpenter work, and in itself forms a good collection of our native finishing woods.

This structure is so designed as to cover exactly the amount of space allotted to your Society, namely 16 feet wide by 21 feet long. Its exterior surface furnishes six alcoves, each appropriated to a different department, while additional wall surface as well as a small office is provided in the interior, and a broad staircase leads to a platform above.

The six alcoves have been appropriated to the following general departments:

Foundations and Masonry; Bridge Superstructure; Hydraulic Machinery; Inland Marine; Rolling Stock; River and Harbor Improvements.

Four of these alcoves are at the corners of the structure, and each of them affords three vertical wall spaces 3 feet wide by 5 feet high, two inclined spaces 3 feet square, and one smaller triangular space. The alcoves devoted to Bridge Superstructure and to Foundations are in the middle of the long sides and twice the size of the others. There are also upon the wall spaces not included above, photographs and drawings representing Elevated Railroads and Gas Works.

The Committee hope to be able to arrange for the preservation of the structure and the collection mounted in its alcoves, as a permanent exhibit of American Engineering; it may be placed after the close of the International Exposition in the Museum of the *Ponts et Chaussées*.

The expenses incurred to date amounted to \$1,108.51.

Of this amount, about \$350 is for framing and mounting the contributions of individual exhibitors. A part of the money so spent has already been returned by the exhibitors, and the expenses, as stated above, are stated as reduced by the sums so repaid. The Committee hope that all exhibitors will see the propriety of paying the cost of preparing their contributions for exhibition, and that nearly or quite all of the \$350 will be returned in this way.

The contributions to date amounted to \$972, and were made by fifty-two individuals and firms, while the Society comprises nearly 600 members.

The Committee originally estimated the expenses of the Exhibit at \$1,500, but believed it important to raise \$2,000, which sum will enable them to publish a small volume descriptive of the Exhibit, with brief historical articles on American Engineering.

The Committee, believing that they are really doing an important work, which as yet is hardly half completed, appeal to the Society and to all who are interested in American Engineering for additional contributions.

After the presentation of the report, it was ordered by the Convention that a subscription paper should be prepared and submitted to Members of the Society, which has been

done. The following clause is from this paper:

Your Committee, thoroughly convinced of the importance of raising additional funds, now send the enclosed subscription blank in accordance with this vote. They would call special attention to the fact, that they propose to publish a small volume in English and French, which shall be descriptive of the Exhibit, and contain brief historical narratives of different departments of American Engineering. The additional subscription will enable your Committee to publish this volume.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

BILLIN, CHARLES E.	(Admitted as Junior, April 5th, 1876), Asst. Eng. Geological Survey of Penna., 4039 Locust St., Philadelphia, Pa.	July 3, 1878.
GLOVER, O. L.	Resident Engineer, Oroya Railroad, Lima, Peru.	April 3, "
HASELL, BENTLEY D.	317 Broadway, New York.	July 3, "
JAMES, SAMUEL L.	New Orleans Pacific R'y, 159 Common Street, New Orleans, La.	May 1, "
KINGSLEY, MARVIN W.	As't Eng. Water Works, 354 Superior St., Cleveland, O.	July 3, "
MELVIN, DAVID N.	Supt. American Linoleum Mfg Co., New Springville, Richmond Co., N.Y.	" " "
RODIE, THOMAS.	Pennsylvania Company, Pittsburgh, Pa.	June 5, "

ASSOCIATE.

ANDREWS, EDWARD R.	10 Warren St., New York.	June 5, 1878.
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CHANGES AND CORRECTIONS.

MEMBERS.

ABERT S. THAYER.	U.S. Civil Engineer, 1907 Penna. Ave., Washington, D.C.
BISSELL, H.	Master Maintenance of Way, Eastern R.R., Salem, Mass.
CHANUTE, O.	As't Genl. Supt. and Chief Engineer, New York, Lake Erie & Western R'y, 187 West Street, New York.
CHESTER, STEPHEN.	Room 6, 239 Broadway, New York.
DUNKLEE, JOHN B.	1907 Penna. Ave., Washington, D.C.
GODWIN, BRYANT.	19 East Thirty-seventh Street, New York.

- HALL, G. THOMAS.....Charlton, Saratoga Co., N. Y.
 HARRIS, ROBERT L.....Chief Engineer, Canada Central Extension R'y, Pembroke, Ontario, Canada.
 HAVEN, WILLIAM A.....Chief Eng. Brattleboro, Whitehall R. R., Brattleboro, Vt.
 LATCHA, J. A.....Coldwater, Mich.
 MERIWETHER, NILES.....Chief Eng., Natchez, Jackson & Columbus R. R., Fayette, Jefferson Co., Miss.
 MORSS, FOSTER.....Engineer for Contractors, Shenandoah Valley R. R., Charleston, Jefferson Co., West Va.
 NORMAN, GEORGE H.....Newport, R. I.
 OLNEY, LA FAYETTE.....33 Niagara Street, Buffalo, N. Y.
 SMITH, F. H.....Eng. and Supt., Baltimore Bridge Co., 13 German St., Baltimore, Md.
 WURTELE, ARTHUR S. C. D. & H. C. Co., 19 Jay Street, Albany, N. Y.

ASSOCIATES.

- PROUT, HENRY G.....Care of Railroad Gazette, 73 Broadway, New York.
 WATKINS, CHARLES D....118 East 115th Street, New York.

JUNIORS.

- BLAND, JOHN C.....265 South Fourth Street, Philadelphia, Pa.
 BURR, WILLIAM H.....Pawling Avenue, Troy, N. Y.
 HAYES, EDMUND.....11 Kremlin Hall, Buffalo, N. Y.
 JOHNSON, L. M.....Genl. Mang. Cairo & St. Louis R.R., 520 Walnut Street, St. Louis, Mo.
 OSGOOD, JOS. O.....Milton, Mass.
 WHINERY, S.Civil Engineer, Georgia Avenue, head of Sixth Street, Chattanooga, Tenn.
 WHITLOCK, FRANK W.....East River Bridge, New York.

FELLOW.

- COIT, EDWARD W.....261 South Fourth Street, Philadelphia, Pa.

DECEASED.

- SCHOTT, C. RIDGELY.....Member.....July 9, 1878.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV, May, 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JULY 3D, 1878.—The Society met at 8 P. M., Vice-President Roberts in the chair.

The ballot upon admission to membership was canvassed, and the following were declared elected as Members: Charles E. Billin of Philadelphia, Pa. (elected Junior April 5th, 1876); Bentley D. Hasell of New York; Marvin W. Kingsley of Cleveland, O.; and David N. Melvin of Staten Island, N. Y.

JULY 17TH, 1878.—The Society met at 8 P. M., Charles E. Emery in the chair.

A paper by Theodore Cooper, entitled "Observations on the stresses developed in metallic bars by applied forces," was read by the Secretary, and discussed by Messrs. Blunden, Bogart, Emery, Melvin, North, Raymond and Yardley.

An interesting set of large scale drawings was exhibited, which had been used at the Institute of Civil Engineers in London to illustrate a paper by Thomas C. Clarke, Member of the Society, and which had been kindly sent to this Society.

OF THE BOARD OF DIRECTION.

MAY 1ST, 1878.—Applications for membership were considered. Appropriations were made. Arrangements for the Tenth Annual Convention were considered. Financial business was transacted and reinsurance of Society property directed.

MAY 13TH, 1878.—Action was taken in reference to the transmission to Members of the report of the Committee on Tests of Iron and Steel. Additional arrangements for the Convention were made.

MAY 29TH, 1878.—Applications for membership were considered.

JUNE 5TH, 1878.—Final arrangements for the Convention were made.

JULY 3D, 1878.—Applications for membership were considered. Appropriations were made.

MEMOIRS OF DECEASED MEMBERS OF THE SOCIETY.

G. W. R. BAYLEY, Member A. S. C. E.

Died December 14, 1876.

GEORGE WILLIAM READ BAYLEY,* was born at Saratoga, in the State of New York, on the 30th November, 1821.

He was the son of G. W. Bayley, a descendant of the early settlers of New England, and who, at the age of four score years, still survives him.

He early exhibited an aptitude for mathematics, and was sent to the Rensselaer Institute at Troy. He graduated in the class of 1838.

His first employment was immediately after graduation, upon the railway from Albany to Buffalo, in his native State. But his health giving way, he went to sea, and spent two years in a tour round the world.

Upon his return he was employed upon the construction of the State prison at Clinton, New York. It was while thus engaged that Gen. P. O. Hebert, at that time Chief Engineer of the State of Louisiana, tendered him a place as assistant engineer, which he resolved to accept. He took up his residence at Baton Rouge, which was then the capital of the State, and served as Assistant State Engineer, under two chief engineers, in succession, till the year 1852.

The duties of this office were peculiar, and limited to the hydrography of the Mississippi River. Naturally of an investigating turn of mind, he entered upon the discussion of some of the most difficult and abstruse problems of hydrodynamic science. This was the beginning of his study of the physics of the Mississippi.

A new direction was given to his studies by his election as Chief Engineer of the New Orleans and Opelousas Railroad, which office he held for nearly ten years.

* Committee to prepare Memoir, W. M. Roberts, E. L. Corthell, C. G. Forshey.

He then acted as City Surveyor of the City of New Orleans, and was subsequently again chosen Engineer of the New Orleans & Opelousas Railroad, and continued as Superintendent and Engineer till its purchase by Charles Morgan, when he was appointed Assistant Chief Engineer and Superintendent of the New Orleans & Chatanooga Road. The construction of the road from New Orleans to Mobile, particularly the renewal of the bridges on that route, demanded the best efforts of the railroad engineer.

There now occurred a collision of duty, to which the railroad engineer is no stranger, and in which Mr. Bayley lost his position by his devotion to duty. The specifications of the contract in grading the track across the Atchafalaya Basin, were such, that the contractor must lose money, or slight his work. As Mr. Bayley's inflexibility in exacting the proper performance of work, was in the way, he was removed in 1872-3.

It was at this time of relaxation that he wrote the "History of Railroads in Louisiana," a work of great research and labor.

His manuscripts were published in numbers in the "Picayune" newspaper. Thus far it has not been put into more permanent form, though containing reliable information.

When the contract was made by Congress for the improvement of the South Pass of the Mississippi by jetties, Mr. Bayley was selected by Capt. Eads as Resident Engineer, and as such, continued till his death. He was a believer in the ultimate success of this method of obtaining deep water to the sea.

Mr. Bayley's professional papers are marked by solidity and research. He wrote the article on the Mississippi in "Appleton's Cyclopaedia." In 1875-6, he served the Louisiana Levee Company, as Engineer and Commissioner of Levees, concurrently with the duties of Resident Engineer of the jetties, which functions he held till his death. He there prepared the article upon "Levees," for "Johnson's Cyclopaedia," and the one upon the same subject, published since, in the Transactions of this Society.

Mr. Bayley undertook too much, and overestimated his health. He was for three years a member of the Board of Health for New Orleans, 1873 to 1876, and as such, entered with much earnestness into the question of disinfection. To him, as the auxiliary of Dr. White, is due, more than to any other citizen, the exemption of the city from epidemics. He wrote an able paper analyzing the results of the use of disinfectants.

Mr. Bayley was a member of the House of Representatives from the City for two years, 1874-6; and was an active and efficient legislator. At the same time he was serving the jetties of the South Pass as Engineer, and was Engineer and Commissioner of Levees. Each of these might have been the business of one man. All, were more than any man could discharge without taxing inordinately his powers. Doubtless they told upon his constitution, and aided to undermine it.

It will be seen that Mr. Bayley's was a very active and busy life, and

that, for nearly the whole of his thirty years in Louisiana, he was engaged with public trusts and great enterprises.

Mr. Bayley's habits of life and demeanor as a citizen were above reproach. Interested in all that transpired, yet never mingling in the exciting contests of politics; and like most men of his religious persuasion, he was singularly free from all excesses in word or deed. He was a firm believer in the doctrines of the "New Jerusalem" church, as taught by Emanuel Swedenborg.

Mr. Bayley was twice married, first in 1842 in New York, and again, in 1851 to Miss Harriet Laws of Atakapas, La.

For a few days prior to his death, he felt unwell, and did not go to his office duties, but sent for his MSS. to finish an article he was preparing for this Society.

He died quite suddenly, December 14th, 1876, leaving a reputation and example of a pure and devoted life.

JAMES P. KIRKWOOD, Member and Past President A. S. C. E.

Died April 22d, 1877.

JAMES P. KIRKWOOD,* was born in Edinburgh, Scotland, March 27, 1807. He was put to school very early, in 1815 was sent to an academy at Galashiels, and in 1818 to Rotterdam, Holland, and returned home after the lapse of a little over a year, having acquired considerable fluency in the Dutch language, and some knowledge of French. He now entered his father's store, where he remained till the fall of 1821, when he was apprenticed to Thomas Granger, land surveyor, who soon associated with himself a Mr. Miller, the firm acquiring a large practice as civil engineers. Mr. Kirkwood served the first term of his apprenticeship, and remained with the firm as an assistant till early in 1832, when he began business for himself in Glasgow, but thinking that the opening for a civil engineer was better in this country, he came here in the summer of the same year. Provided with letters to Wm. Gibbs McNeil (then and for a long time subsequently a railway engineer of the largest practice), he commenced under McNeil with the location of the Norwich & Worcester Railroad; was thence transferred to the Boston & Providence Railroad, and subsequently to the Stonington & Providence Railroad as Resident Engineer. Still later he became the Resident Engineer on the Long Island Railroad, which was opened to Hicksville in 1837. In 1839 he was engaged on the preliminary works of Flynn's Knoll Light House, New York harbor, under the orders of the U. S. Engineers. This was a most laborious work, requiring his residence at the quarries in the State of Maine for a great part of the time, alternating with his personal supervision of the construction of the coffer dam and foundations in the harbor. The storms of the winter damaged the works very

* Committee to prepare Memoir, A. W. Craven, J. W. Adams, Wm. E. Worthen, Jas. B. Francis.

seriously, and the Government suspended operations, which have never been resumed,

In the spring of 1840 his services were called for on the mountain division of the Western Railroad of Massachusetts, on which he was engaged as Resident Engineer until its completion, in the fall of 1843. Between this date and his taking charge of the location and construction of the Springfield and Northampton Railroad, he was engaged in the preparation of plans and construction of the Delavan House, in Albany, at that time regarded as a work of some magnitude. His health requiring a more genial climate, led to his acceptance from the U. S. Government of the position of Engineer for the Construction of Docks, Hospital, Workshops, and, in fact, all the appurtenances required in a great naval depot, then projected at Pensacola, Florida. He continued on this work until the suspension of the appropriations by the Government for its continuance, in May, 1847. The New York and Erie Railroad having undertaken the construction of a stone arched viaduct on the line of that road, of 16 arches, of 50 feet span each, and 100 feet high, and it being apparent that unless it was built in one season, the opening of the road for travel would be seriously delayed, he was solicited to take charge of that work as Superintendent, and carry it to completion by days' labor, which he accomplished in December, 1848—an unprecedented piece of work to be accomplished in one working season. This led to his appointment as General Superintendent of the Erie Railroad, and in this position he introduced many radical changes, resulting in great improvements in the running of the railroad, and which have been adopted on other roads in this country without acknowledgment—notably, the running of trains by telegraph, introduced by him. His determination to make this great road, so far as the operation of his department tended, what, from its leading position in connection with the West and the great metropolis, it was designed to be, led to opposition from men in office, who did not possess the breadth of view essential to the appreciation of the scope of his efforts; and failing the proper support from them, he resigned the charge of the road to accept the position of Chief Engineer of the Missouri Pacific Railroad in 1850. Perfecting the surveys and construction of that road as far as the means of the company permitted, he returned to New York in 1855. Still retaining connection with that road as Consulting Engineer, he took charge under the Croton Department of the work of lowering and moving horizontally the great water main in Eighth avenue into a rock cut, without cutting off or interrupting the supply of the water to the city through the main—a work of great delicacy. In June, 1856, he received the appointment of Chief Engineer of the Nassau Water Works, Brooklyn, and continued in the office until its completion in 1860. He visited Europe at this time on account of his health, and remained a winter in the south of France, but with little permanent benefit. Unwilling to lose the benefit of his advice in the first management of the work, the Commissioners of Nassau Water Works

wished to retain his services as Consulting Engineer, which he accepted only on condition that it should be without salary. During this time he investigated and reported upon the subject of lead poison in water pipes, and held very positive views upon that subject. He was consulted by the Erie Railroad Company in reference to the Bergen Tunnel, at Jersey City, which he completed, as also on the arrangements of ferries and Long Dock. He served as Commissioner (1859) on the raising the High Bridge at Carmansville Croton Aqueduct; also, in 1860, on a commission for location of terminal depot at Hunter's Point, Long Island Railroad. He reported to the Long Dock Company, on a system of docks and ferries, embracing elevators and floating docks of iron for the reception and handling of grain. Again his health, in 1863, required him to travel, and in 1864 he devoted some time to the Murray Hill distribution, Croton Water Works; and with Messrs. G. R. Baldwin and J. W. Adams, made an examination and report on the entire line from Fishkill to Boston, of the Boston, Hartford and Fishkill Railroad. He was also consulted on the location of high service reservoirs and pumping engines at High Bridge, Croton Water Works.

In March, 1865, he made extensive examinations and exhaustive report on the subject of the Water Works of Cincinnati; and also, in the same year, made similar examination and report on the Water Works of St. Louis, the Water Commissioners of the latter city authorizing him to visit Europe, and examine and report upon the various methods of filtering water for city use pursued in the cities of Great Britain and the Continent. He returned in September, 1866, and the result of his labors appears in an elaborate published report, with copious illustrations of the methods pursued in the principal cities of Europe for purifying city water. This work serves as a text-book for engineers in this branch of hydraulics. While in London, on this visit, he examined and reported to some interested citizens of New York, upon the underground railways of London, and their working. He also reported on the Bergen Tunnel, and returned to St. Louis to examine and report upon the location of pumping stations for that city, with settling basins and a high reservoir service, the basis of the present water work construction for that city. Being offered the position (April, 1867) of Chief Engineer, to carry out his plans, he declined, accepting the position of Consulting Engineer, with the privilege of making his own selection of Chief Engineer and Assistant, being responsible for the work, but retired from the immediate supervision. All the important structures were built from his designs, or plans approved by him. This embraced the pumping engine and specification for the same. At this time he was consulted on the designs of the third Ridgewood engine, Brooklyn Water Works, and it was designed under his direction.

In 1868, still in the employ of the Water Commission of St. Louis,

he was consulted on various water works—Pittsburg, Pa., Portland, Maine, and Salem, Mass.

In 1869 he reported on the extension of the Brooklyn Water Works by the construction of additional reservoirs. In the same year he was appointed Consulting Engineer of the Water Works of Poughkeepsie, N. Y. ; in 1870, of the Water Works at Lowell, Mass. ; in 1871, of the Water Works at Fall River, Mass. ; in 1873, of the Water Works of Lawrence, Mass. In 1872 he made a report on the additional supply of water for the city of Albany, N. Y., and afterwards had charge of the construction of the works. In the same year he drew up the specifications for the construction of the storage reservoir, Hempstead, L. I. In 1873 he made investigations and report on new water works for Hoboken and Weehawken. In 1874, in conjunction with Mr. James B. Francis, he made a report on the additional supply for the city of Boston, and in the same year an examination and report upon the drainage of the low lands in Hoboken, involving the use of pumping machinery to lift the contents of the sewers to the level of tide. In 1875 he made an extended examination and report to the Massachusetts State Board of Health on the pollution of rivers. In 1876 he made a report on the necessity and means of economizing the water supply of Lynn, Mass.

The above list of reports made and works constructed is necessarily imperfect. In the earlier years of his practice, Mr. Kirkwood kept a diary, but latterly the memoranda were desultory and imperfect. The list is, therefore, made up from published reports, and from the recollection of your committee, who were all more or less associated with him in business. He was often on commissions for the testing of pumping engines, for advice on constructions, and few of the water works for the large cities have been undertaken or carried out without consultation with him.

In Mr. Kirkwood's life may be traced the beginning and growth of our engineering profession. He commenced in 1821 by entering the office of a land surveyor, when the distinction of civil engineer was hardly known ; he began with dragging the chain and the usual office work of the land surveyor ; but in the call for further works the land surveyors became a firm of civil engineers, with large practice in railways and canals. By 11 years of industry with this firm Mr. Kirkwood had acquired a practical knowledge of the profession as it then was, and after a short trial by himself in Glasgow he started for this country, where he trusted his knowledge might be of value. In this he was not disappointed ; from the valued assistant of Major McNiell he passed to the charge of varied works—filling most important offices, especially in the department of railway engineering, in which he occupied, at times, different grades and duties, as assistant, chief and consulting engineer, once on the Missouri Pacific, as contractor, and lastly on the Erie railroad, acting as General Superintendent and taking charge of the running of the road. Up to 1855 Mr. Kirkwood's labors were almost entirely con-

fined to railway engineering, and he was considered at the head of his profession. Having been called, by Mr. A. W. Craven, to the charge of some work in the Croton Department, which was successfully executed, on the determination of the City of Brooklyn to construct water works he was made the Chief Engineer. With this appointment his attention was almost entirely diverted to water works for the supplies of cities and towns. This branch of the profession, at that time, was but little studied, and its demands very limited, but Mr. Kirkwood brought to it that wonderful perseverance and industry which had given him his position in the railway branch. His life had always been an eminently practical one; there were no schools in his youth where even the rudiments of the profession could be studied; public works which might serve for precedents were few and the knowledge of them but little diffused. Soon the demands of the times and the needs of the profession increased beyond the precedents; works were undertaken and constructed on the basis of the best common sense of the time, and the theory of construction followed after. When he entered upon the construction of water works for cities, as in his first commencement on railways, examples were few, and the literature connected with this branch very meagre. Mr. Kirkwood made thorough inspection of what had been done, both here and abroad, and secured all books pertinent to the subject; he has left constructions which will long stand as precedents, and has enriched the literature by valuable memoirs and reports. From his nature and education he was eminently conservative, and it required strong proofs of economy in construction and maintenance to make him give up old and well tried modes or machines. He never adopted a theory merely because it was novel, or to obtain credit for its introduction; nor made expensive experiments at the cost of parties employing him. Safety was a large factor in his constructions, and he preferred the credit of doing better what had already been executed to striking out new and uncertain paths. Yet, with a full knowledge of precedents, it was not a blind following, and the improvements introduced by him have been many and gradual; the growth was strong and natural. He early introduced the coating of water mains, and the improvements of pumping engines have been largely due to his approval. During the last 25 years of his life Mr. Kirkwood was an invalid, but the works undertaken during that time show no feebleness in design nor execution, and in number and importance they exceed those of any other engineer in his line in the country. Called as an advisory engineer on the Lynn Water Works, near the close of his life, and confined to his hotel by severe cold weather, the President of the Board remarked, after an interview with him, "that it was a wonder to him that one so reduced in strength could command the great store of facts and principles his life time had gathered and so readily apply them to the matter in hand," and this we think to have been the universal sentiment with all those with whom he was brought into contact. He

gave the conviction of a thorough knowledge of his subject, acquired by long practice and extended reading, and a sterling honesty, in the statement of his views and recommendations.

Mr. Kirkwood was the second President of the American Society of Civil Engineers, and well known to most of its members, and especially to the members of this committee—life time friends who, from their intimate relations with him, both professionally and socially, could appreciate him; both as an engineer and as a man with a professional knowledge based on strong common sense, and extended by close observation and unwearied industry; he was extremely sensitive about placing himself under any financial obligations, and modestly underrated the value of his own services. The counsel of no one could be more safely trusted than that of Mr. Kirkwood, as he had the elements which go to make up a safe counsellor—modesty, rapacity and integrity.

CHARLES S. EMACK, Member A. S. C. E.

Died July 26th, 1877.

CHARLES S. EMACK* was born in April, 1834, in the Town of Lambertville, New Jersey, and died July 26th, 1877.

He had the advantages of a good education, under the instruction of the late Samuel H. Parsons, a thorough teacher, and practical mathematician.

In 1852 or '3 Mr. Emack was taken on to the Belvidere railroad by Mr. Ashbel Welch, and continued thereon during its construction.

In 1857 Mr. Emack entered the service of the Hazleton Coal and Railroad Company, under Martin Coryell; but his health was not sufficient to withstand the laborious work of mountain surveys, and the damp underground work of the mines, and he left, to find more congenial employment under Mr. Thomas Seabrook; and in January, 1859, entered, in the capacity of a *rodman*, upon the surveys and estimates of the Pittsburgh & Steubenville, and Chartiers Valley, Hempfield, Marietta & Cincinnati Railroads, and two or three other lines or branches of railways.

In 1861 Mr. Emack took charge of the Steubenville extension of the Pennsylvania Railroad, as principal Assistant Engineer, and left, in 1865, to take charge of the masonry on the connecting railroad of Philadelphia, and remained until the completion in 1867.

In 1868 he went with Mr. Thomas Seabrook to Baltimore and acted as Chief Engineer of the Baltimore & Potomac Railroad.

In 1872 his health so failed him that he had to resign his charge and seek rest and quiet.

In so doing he sought the mild climate of Virginia, and there found a wife who was willing to take upon herself the care of an invalid, and

* Committee to prepare memoir—Martin Coryell, G. Leverich.

those who knew the kind disposition and the sterling integrity of Mr. Emack are not surprised that his declining health found a kind and sympathising heart to share with him the burdens of life.

Mr. Emack was not conspicuous as an engineer beyond the immediate vicinity of his work, but his faithful attendance to the duties assigned him ever commanded the respect of those with whom he was associated.

Had his health been spared he would have contributed largely to the general information of our profession, for his industry and indefatigable zeal filled his note books with facts and figures and the practical results of every day's experience in interesting works.

ROBERT L. COOKE, Member A. S. C. E.

Died August 11th, 1877.

ROBERT LATIMER COOKE,* was born at Williston, Vermont, on June 27th, 1809. He was graduated at Middlebury College, in his 18th year, and afterwards was admitted to the Bar. He soon, however, surrendered the practice of law and devoted himself to teaching, first at Stanton, Virginia, and afterwards for twenty years at Bloomfield, New Jersey.

He then entered the service of the Lehigh Coal and Navigation Company, as an Assistant Engineer, and for a number of years was employed in surveys of the lands of the company, and the construction of its roads. A history of this company and its works was contributed by him to the Society, on April 19th, 1876. Subsequently he held the position of Superintendent of Construction of the Lake Champlain & Moriah Railroad, in the State of New York.

In 1871 he was appointed an Assistant Engineer on the Topographical Surveys of the southern portion of Westchester County, since annexed to New York City. This work was under the control of the Department of Public Parks, and he remained in the employ of that Department as a Division Engineer, on the laying out of the new wards, and later as assistant in the preparation of plans for a new iron bridge across the Harlem River, until his death, which occurred on August 11th, 1877, and which was caused by his being washed overboard in crossing Fire Island bar, on the Long Island coast.

Mr. Cooke possessed extraordinary vigor, both mental and physical, an unusually cheerful disposition, and a warm and affectionate heart. His industry and earnestness in any work on which he was engaged, were the natural results of the conscientiousness and deep religious principles which actuated his whole life. Whatever fell to his lot to perform, was done carefully, intelligently, and thoroughly. His hours of relaxation

* Committee to prepare memoir, J. J. B. Croes, C. R. Schott, G. Leverich.

were spent in what, to many younger and less active men, would have been arduous work. During the last two years of his life he devoted his evenings to the illustration of a work on Conchology, by finely executed pen and ink drawings, and to the last he kept up the reputation he had deservedly acquired among his friends, of an accomplished and thorough musician.

He was elected a member of this Society April 17th, 1872, and always displayed great interest in its progress and the preservation of a sound policy in its management.

WILLIAM B. OGDEN, Fellow A. S. C. E.

Died August 3d, 1877.

WILLIAM B. OGDEN* was born in Walton, Delaware County, New York, June 15th, 1805, and died August 3d, 1877, at Boscobel, New York City. Descended from parents and ancestors distinguished for their intellectual and social characteristics, as well as honorable official positions, Mr. Ogden naturally began to value mental culture when quite young. With a remarkably vigorous and healthy body, and the usual fondness for boyish sports, he early manifested a love of study, and was preparing to enter college with the view of making law his profession when, at the age of sixteen, he was compelled, by the death of his father, to change his plans. He at once took charge of the family estate, and exhibited extraordinary prudence, judgment and energy in the management of affairs.

He supervised the cutting down of large tracts of timber in his native county, and the floating of it down the Delaware river to Philadelphia. This and other business transactions brought him in contact with some of the leading men of the day, and gave him more enlarged views of the commerce and condition of the country than most persons of riper years possessed. At that time a journey on a raft from Delaware County to Philadelphia was a much more formidable affair, as regards time and danger, than a voyage across the ocean is now. Then there was not a mile of railroad in the country, and but few portions of it possessed good turnpikes. Canals and steamboats existed to a very limited extent.

At eighteen, Mr. Ogden was made Brigade Inspector of the State militia, and continued to serve as such for several years. At twenty-one he was received into partnership by an important commercial house. At twenty-nine he was sent to the Legislature of his native State, and made masterly efforts to secure the construction of the Erie Railroad. Although the bill did not pass that session, it did the next.

Mr. Ogden's comprehensive views led him to see much farther than

* Committee to prepare memoir—E. S. Chesbrough, George S. Greene, John Bogart.

most men into the future wants and condition of the country. His faith in the early and rapid opening up of the great West was such that he invested largely in real estate in Chicago, to which place he removed his residence in 1835.

The same effective participation which Mr. Ogden took in public affairs in the East did not diminish when he removed West, and it naturally made him very popular, so that when Chicago was first incorporated as a City in 1837, he was elected Mayor. He looked carefully into such projects as promised to benefit his adopted City and the Southwest, and was specially active in encouraging the construction of the Illinois & Michigan Canal.

He took the most prominent part in the commencement of the Chicago & Galena Railroad, and pledged his private fortune, with one or two others, for its completion as far as Elgin, when capital was exceedingly scarce in the west, public faith in the financial success of the undertaking discouragingly weak, and the opposition of supposed rival interests very strong. When the panic of 1836-7, prostrated public and private enterprise, Mr. Ogden was suddenly overwhelmed with a crushing load of obligations he could not meet, owing to the greatly depreciated value of his property. His sense of honor and integrity, however, and the confidence of his friends in him, was such that in a few years he met fully every claim against him. He also exerted his utmost influence by public addresses and private conversation, to arrest the almost universal tendency to repudiate State and municipal indebtedness, and had the satisfaction of seeing his views prevail.

During the long prostration of the West, between 1837 and 1843, Mr. Ogden's hopefulness of a prosperous future did not desert him, but led him to great activity in devising both public and private enterprises, and aiding to carry them out. He labored successfully with those who caused a resumption in 1843, of work on the Illinois & Michigan Canal, which was completed in April, 1848. He also succeeded, by the purchase of an old Indiana charter, in establishing the first connection eastward of Chicago, by railroad, under the auspices of the Michigan Southern & Northern Indiana Railroad.

In 1847 he negotiated the charter and assets of the Galena & Chicago Union Railroad Company, and became its president. In the further extension of this road to the Mississippi, when the stock was greatly depreciated in value, and many owners among the farmers were smarting under their losses, so that it was considered imprudent for a director of the road to go among them, Mr. Ogden and his companions boldly ventured along the line addressing meetings of farmers and others on the importance and value of the work, and succeeded in obtaining many new subscriptions. When this road was first commenced there was a very large retail trade in the City kept up by means of wagons, called "prairie schooners," five acres of which would be sometimes encamped together. Lines of stages were also profitably employed. The mer-

chants engaged in this trade, and the owners of the stages and wagons, all thought they would be greatly injured by the loss of their business, but Mr. Ogden had the gratification, in a few years, of seeing that most, if not all, of those persons had been benefited by the construction of the road. The rapid growth of the City greatly increased business, and the stockholders of the company received annual dividends of upwards of twenty per cent. during the first seven years after the completion of the road.

In 1853 Mr. Ogden visited Europe, and remained about a year and a half. While devoting much of his time to art and æsthetic culture generally, his deep interest in public works did not diminish. He made a special study of the canals of Holland, and became more than ever impressed with the importance of so enlarging and deepening the Illinois & Michigan Canal as to make it navigable for steamboats suitable to ply between Chicago and New Orleans, a work which, in connection with the Illinois river locks and draws, now partly constructed by the State, must yet be completed before our national system of improvements can be considered perfect. He also advocated, in 1854, through the Chicago press, the construction of a ship canal across the southern portion of the Michigan peninsula.

In 1855, Mr. Ogden was made president of the newly formed Board of Sewerage Commissioners of Chicago, and remained in office long enough to see the present system of drainage for that City adopted, and so far carried out as to show its beneficial action, and cause the community to urge its further extension as rapidly as means would permit.

At about this time Mr. Ogden was made president of the Chicago, St. Paul & Fond du Lac Railway Company. Considering the magnitude of this work, and the financial disasters of 1857, probably no enterprise Mr. Ogden ever engaged in taxed his time and resources more than this. In 1857 he found himself under personal obligation to pay debts of the company amounting to \$1,500,000. The value of the stock disappeared, and a foreign negotiation of bonds, supposed to have been effected, fell through. At such a time it was impossible for him to raise so great a sum of money, but he unreservedly placed the whole of his large property in the hands of the creditors of the company. Friends and family connections placed theirs also at his disposal, and the result was a full payment of the claimants, and the saving of Mr. Ogden's private fortune from ruin, though with a very considerable loss to him. During his connection with this road Mr. Ogden constructed sixty miles of it, from Janesville, north, in fifty-eight days, a feat never previously performed in the history of such works. While constructing this road Mr. Ogden saw that it was likely to enter into disastrous competition with the branch system of the Chicago & Galena Railroad, and used all his influence to bring about a consolidation of the two companies, finally succeeding, in 1864, thus greatly increasing the importance of the Chicago

& Northwestern Railroad Company, which now owns and operates over 2,000 miles of road, and into which the Fond du Lac road had previously been merged.

So great were Mr. Ogden's qualifications as a manager of railroad interests that while director of the Fort Wayne & Chicago Railway Company in 1859, he convinced the owners of the then fragmentary lines, now forming that one road, of the necessity of consolidation. This required the appointment of a receiver during the pendency of the proceedings necessary for the union, and Mr. Ogden was offered a salary of \$25,000 to accept the office. This he declined on account of other very weighty public and private obligations; but upon being told that it was impossible to agree upon any other name than his, he accepted the office, refusing, however, the munificent salary.

In 1850, Mr. Ogden was chosen president of the National Pacific Railroad Convention, at Philadelphia, and afterwards, upon the organizing of the Union Pacific Railway Company, he was elected its first president. He also continued a firm believer in the practicability and final success of the Northern Pacific Railway, with which he was officially connected from the commencement, and actually passed, in company with the Chief Engineer, Col. Roberts, along a considerable portion of the proposed route; on the Atlantic side, from Lake Superior to the Missouri river, and on the Pacific side from the mouth of Snake River *via* the Columbia Valley to Puget Sound.

Mr. Ogden had an honorable and important connection with other public works than those already mentioned. He was also a friend of religious, literary, scientific and benevolent institutions, contributing liberally for their support during his life, and leaving what will amount to a large sum, to be expended in a similar manner by his administrators.

Mr. Ogden was engaged to be married when quite young, but the decease of the lady prevented the union. His large fortune, and the residence with him of one or more of his sisters, enabled him to exercise a hospitality becoming the high position he held, socially and officially, as very many foreigners and visitors from other parts of our own country have known. His cultivated taste enabled him to furnish his home with every desirable comfort and adornment. Men of distinction in every profession, and from nearly every land, were entertained as his guests, with ease and dignity. He was perfectly accessible to men of the humblest stations, and never repelled any who had the least claim to his time or consideration. At seventy he married Miss Arnot, of Elmira, New York, who was in every way suited to be the companion of so rare and distinguished a man. She still survives him and resides at Boscobel, which Mr. Ogden had made his home during the last ten years of his life, having removed from Chicago to New York on account of very important private interests which demanded his personal attention, but he kept up his Chicago home and residence until the fire of October, 1871.

What has already been said of Mr. Ogden is fully sufficient to show that he was one of that small class of men to whom engineering is more indebted than to all others for its wonderful progress in our country. His great physical and mental power, his extraordinary training, his courage, hopefulness and high sense of honor, and his dignified, yet affable bearing eminently fitted him to be the leader of whatever enterprise he took an interest in. It was by no means, however, so much Mr. Ogden's object to obtain control of works he was connected with, as to make them succeed, in which case he was content with any position from that of simple advocate, to being the principal. Even his vast and masterly arranged private schemes were such as to benefit the public either directly as sources of employment and profit to thousands, for instance, the Peshtigo Lumber Company, or the Brady's Bend Iron Works; or they were to show the public what could be done in certain much needed directions, as well as to accommodate his own business, such as the small, but first outside harbor of Chicago.

It was natural that one of such great ability and experience should be much consulted in relation to enterprises with which he had no official connection. Among these was the first Chicago Lake tunnel, a work which he was one of the earliest to approve and offered to publicly advocate it, if necessary, for its adoption by the city authorities.

True greatness is often proved by adversity. Mr. Ogden had his full share of opposition, detraction and disappointment. Plunged sometimes from superabounding wealth to sudden inability to meet his obligations, he found it difficult at times to pay his table expenses, yet few of his intimate friends seemed to be aware of it. In a day, stripped by the great fires of Chicago and Peshtigo of a million and a half of dollars, and left without income sufficient to meet his taxes, he spoke with great confidence to his fellow sufferers of the prosperous future of Chicago and the West; and encouraged them to go forward in rebuilding the city.

Mr. Ogden was repeatedly urged to be a candidate for high political honors, and was naturally fitted for the highest, but his chosen course of life, as already mentioned, his tastes, and above all his independence of party control, prevented him from accepting positions of this kind unless he saw that in so doing he could serve the interests of the community around him, when he cheerfully performed the humbler duties of City Alderman or those of State Senator.

JOHN F. TRACY, Fellow A. S. C. E.

Died February 13th 1878.

JOHN F. TRACY* died in the City of Erie, State of Pennsylvania, February 13th, 1878. Mr. Tracy was born in that City, January 7th, 1827, he was therefore only a little over fifty-one years old at

* Committee to prepare memoir, W. M. Roberts, M. Courtright, John Bogart.

the time of his death. He became a Fellow of this Society January 20th, 1873. Although thus cut off in the prime of life, Mr. Tracy was associated for a long period with great railroad enterprises, in which he displayed marked genius, enterprise and perseverance, which were crowned with success. He was one of the master spirits among the progressive railroad men of our country, and was largely instrumental in pushing forward the great iron thoroughfares which now carry across this vast continent the commerce between the Atlantic and the Pacific. He was educated at the old Erie Academy, but early in life became an active assistant in the extensive business of his father, Mr. John A. Tracy, who was an eminent contractor, engaged in the construction of canals and railroads. His father built the aqueduct over Walnut Creek, on the Erie Canal, which, at the time—thirty-five years ago, was regarded as a great work. It was eight hundred feet long, and one hundred and one feet high. It was during the prosecution of that work that Mr. Tracy was brought directly under the business training of his able parent, and where he soon exhibited more than usual capacity as a manager, although then but a boy. Subsequently, Messrs. John A. Tracy and Milton Courtright, were associated as contractors in building the Western Division of the Erie Railway, and by them he was employed to superintend the extensive operations of the firm. After the completion of that contract, he was still more actively engaged in the construction of the portion of the Buffalo & State Line Railroad, west of Dunkirk, and of the Erie and Northeast Railroad, and, though not yet twenty-five years old, almost the entire practical management of these enterprises was confided to his care. Very shortly after the completion of the Erie & Northeast road, he was appointed its Superintendent, and operated the road with ability and success. When it was decided to change the gauge of the road and make it part of a through line—a determination which was violently opposed by a large party of citizens in Erie, and which brought on the trouble known as the "Erie Railroad War," Mr. Tracy held his post with firmness and devotion to the interests of his company, and was the only man who never yielded to the pressure of the mistaken popular sentiment which sought to maintain a break in the continuous line of what was destined to become a great continental highway. Mr. Tracy completed the change of gauge, determined on by his own company, and when the work was perfected, in 1854, decided to leave Erie, and accept the position of Assistant Superintendent on the Chicago & Rock Island Railroad, which was then in process of construction. His experience and ability made him an invaluable official, and he was soon promoted to the office of General Superintendent; subsequently was made Vice-President, and finally President of the road, which office he held for many years, and, until compelled by reason of ill health, to resign less than a year prior to his death.

Under Mr. Tracy's management the Chicago, Rock Island & Pacific Railroad acquired a wide reputation. Its bonds were eagerly sought for in every market as investments, and its stock has always continued to pay dividends, and maintains a high price. No road in the country can exhibit a better financial condition, and no act of the Rock Island Company has ever brought discredit to the reputation of American securities. The consequence of this is that the company are able to market their six per cent. bonds at par, and Mr. Tracy always had the unlimited confidence of the representative capitalists of this country and Europe. During the presidency of Mr. Tracy, the Iowa Division was constructed under his management, from the sale of stock alone—a feat unparalleled in the history of American roads. At the same time, while maintaining his position as president of his favorite corporation, the Rock Island, Mr. Tracy secured the control of the Chicago & Northwestern Railroad, and became its president, thereby making himself the direct manager of over thirty-five hundred miles of railroad. He took the position in 1870. After five years service, Mr. Tracy resigned the presidency, suggesting as his successor, Mr. Keep, who is now President of the Northwestern. Mr. Tracy was, while his health remained and his faculties were clear, an expert and successful manager of railroads. He was reticent, determined, and, above all, self-reliant. His roads were managed with a faithfulness and economy rarely equaled. In his business projects he was successful, and during the thirty years of his active life he did his full share in the development of the railway interests of this country, and for the perfection of the American system of railway organization.

With his immense influence in the commercial world, Mr. Tracy was always a quiet, unassuming man, who neither sought nor cared for notoriety.

When Mr. Tracy first assumed official position upon the Chicago, Rock Island & Pacific, its terminus was at Rock Island. Under his management it was extended across the State of Iowa to Council Bluffs, and branches were acquired or leased, so that now over a thousand miles are operated by this Company. The Chicago & Northwestern was also, under his administration, extended from Madison, Wisconsin, to Winona, on the Mississippi River, and a large portion of the branch from Winona to St. Peters was built, as well as the air-line from Milwaukee to Fond du Lac. While upon the Rock Island road, with characteristic energy and pertinacity, he fought to successful issue the contest with the river interest, headed by the St. Louis Chamber of Commerce, which was opposed to the bridging of the Mississippi River; and thus secured a national recognition of the doctrine that navigable rivers, though hitherto protected from all obstructions, must permit bridges to be built across them for the accommodation of those other great commercial highways, the railroads.

In his private life, Mr. Tracy was one of the least ostentatious and most kind hearted of men. His large wealth was bestowed generously in public and private charity.

The intense application to business which was Mr. Tracy's prominent characteristic, began, some years since, to wear upon his physical health. About a year ago his sufferings increased so that business was absolutely forbidden by his physician, and he resigned the presidency of the Rock Island Railroad, and gave up all participation in financial affairs.

In the course of nature, ere many years, all the pioneers of our great works of public improvement will have passed away. It is well to record among the annals of our Society, however briefly and inadequately, some account of our members who have held an honorable place among them.

P. PORTER POINIER, Junior A, S. C. E.

Died June 11th, 1876.

P. PORTER POINIER,* only son of Elisha B. and Frances A. Poinier of Newark, New Jersey, died in the City of New York, June 11th, 1876, aged 23 years.

He was a student in the Rensselaer Polytechnic Institute, Troy, during the scholastic year 1871-2, after which he entered the Stevens Institute of Technology, Hoboken, from which he graduated with honor in 1874. During the following year he pursued his studies as post graduate and lecturer to the senior class in the Institute on Thermodynamics.

He became a Member of this Society March 3d, 1875, and took great interest in its welfare and success. He was enthusiastic in the study of abstract and applied mathematics, and had almost a passion for making original investigations, and to aid him in these directions he secured quite a library of rare and valuable foreign works. He finally concentrated his labors upon his favorite subject, that of dynamics of heat, and had gone to Cambridge to superintend the publication of his work upon this subject, when he was suddenly prostrated by a disease which had been preying upon him, and which was pronounced incurable. His ambition was strong, and aims high; and he had already brought himself to the notice of the learned. The trustees of the John Hopkins University, Baltimore, appointed him to a Fellowship in that institution, the certificate for which reached his friends only the day after his death; and Prof. William Thompson, in his recent address before the British Association for the Advancement of Science made honorable mention of him as a young investigator and promising student.

* Committee to prepare Memoir, R. H. Thurston, DeVolson Wood.

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Report of Board as to preservation of water front at Vicksburg.

Report of Commission as to Washington Monument. (2 copies.)

Report of Commissioners of District of Columbia, giving information in reference to bituminous and wood pavements. Lieut. R. S. Hoxie. (2 copies.)

Information as to removal of sunken wrecks at Pensacola. Capt. A. N. Damrell. (2 copies.)

Report upon Saint Croix River. Maj. F. W. Farquhar. (2 copies.)

Information as to ship canal at entrance of Charleston Harbor. Gen. Q. A. Gillmore. (2 copies.)

Report upon bridging the Saginaw River. Major F. Harwood. (2 copies.)

Report upon effect of reservoirs on navigation of the Mississippi River. Maj. D. C. Houston. (2 copies.)

Report upon protection of harbor of Cincinnati. Maj. W. E. Merrill. (2 copies.)

Report upon improvement of Flushing Bay, New York. Col. John Newton. (2 copies.)

Report upon improvement of Cape Fear Harbor. Capt. Charles B. Phillips.

Report upon improvement of Sturgeon Bay and Lake Michigan Ship Canal and Harbor. Maj. H. M. Robert. (2 copies.)

Report upon lines of communication between Colorado and New Mexico. Lieut. E. H. Rufner.

Report upon removing a bar in the Arkansas River, near Fort Smith. Maj. C. R. Suter.

Report upon Survey of the Missouri River at Omaha. Jan. 10th, 1878. Maj. C. R. Suter. (2 copies.)

Report upon inspection made in Summer of 1877, by Gens. Sherman and Sheridan north of the Union Pacific R. R.

Report upon improvement of the "Gut," opposite Bath, Me. Col. Geo. Thom. (2 copies.)

Report upon Penobscot River at Bath, Me. Col. George Thom.

Geographical and Topographical Atlas accompanying Report of Geological Exploration of the 40th parallel. Clarence King.

Geographical Surveys west of the 100th meridian. Vol. II. Astronomy and Barometric Hypsometry. Lieut. Geo. M. Wheeler.

From Hanover Society of Architects and Engineers :
Transactions. Part I. 1878.

From L. M. Haupt, Philadelphia :
Manual of Engineering Specifications and Contracts. L. M. Haupt. Philadelphia. 1878.

From R. Hering, Philadelphia :
House and Street Drainage. R. Hering. Philadelphia. 1878.

From C. Herschel, Boston :
The Cape Cod Ship Canal. C. Herschel. Boston. 1878.

From the Institution of Civil Engineers, London :
Publications of the Institution, edited by James Forrest, Secretary, as follows :
Abstract of papers in foreign transactions and periodicals. Part 2. 1877-8.
Irrigation in the South of France. George Wilson.

Liquid Fuels. Harrison Aydon.
On the evaporative power of locomotive boilers. J. A. Longridge.
Review of the progress of steam shipping during the last quarter of a century. Alfred Holt.

Some recent improvements in Dynamo-Electric Apparatus. Higgs and Brille.
The encroachments of the Sea at Flamboro' Head, and works executed to prevent the loss of land. R. Pickett.
The works of the Bilbao Iron Company in Biscay, Spain. F. C. Barron.

From the Institution of Mechanical Engineers. London :
Proceedings, January, 1878.

From John Kennedy, Montreal :
Annual Report of Harbor Commissioners of Montreal, for 1877.

From George A. Kimball, Somerville, Mass. :
Annual Reports of the City of Somerville, for 1877.
Fourth Annual Report of the City Engineer of Somerville, for 1877.

From P. F. Kupka, Vienna, Austria :
Amerikanische Eisenbahnen. P. F. Kupka, Vienna.

From Charles Lagasse, Brussels, Belgium :
Notice sur la Sonnette à poudre à Canon en usage aux Etats-Unis d'Amerique. C. Lagasse, Bruxelles. 1878.

From C. Latimer, Cleveland, O. :
Proceedings of Meeting of road masters of the Atlantic and Great Western R. R. Nov. 15th, 1877.

Comparative Statement of Expenses in Engineering Department of the A. & G. W. R. R. December, January, February, 1877-8.

From G. Leverich, Brooklyn, N. Y. :
Memorial relating to tests of Experimental Guns. Leverich and Mann. Washington, 1878.

From Charles Macdonald, New York :
Illustrated Album of the Delaware Bridge Company. 1878.

From Edward Marsland :
Photographs of U. S. Dredge Boat, "McAlester;" of the engines of the "McAlester;" of the engines of the "Geo. W. Elder;" of

- double engines by Rowland; of the New York Calsson of the East River Bridge. 7 Photographs.
- Engravings of the U. S. Dredge Boat, "Es-sayons;" of the P. & S. Steamer, "Massachusetts."
- Description of the Marsland Water Meter. E. Marsland, Philadelphia. 1876.
- From W. Ripley Nichols, Boston :
On the Filtration of Water. W. R. Nichols, Boston. 1878.
- Die Städtische Wasserversorgung. 1 Band. Statistik Beschreibung der Anlagen in Bau und Betrieb. E. Grahn, München. 1878.
- From the North of England Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne :
Transactions of the Institute, February, March April, 1878.
- From Charles Paine, Cleveland, O. :
Miles run by Engine, Tender and Passenger equipment, and Wheels removed during 1877. Lake Shore and Mich. Southern Ry.
- From William H. Paine, New York :
Specifications for Iron Work of Suspended Structure of East River Bridge. 1878.
- From Portuguese Association of Civil Engineers, Lisbon :
Review of Public Works and Mines. January, 1878.
- From L. W. Post, Jersey City, N. J. :
Specifications for Reservoir No. 3, Jersey City Water Works. 1878.
- From H. G. Prout, Cairo, Egypt :
General Report on the Province of Kordofan, Lt. Col. H. G. Prout, Cairo. 1878.
- From F. Rinecker, Wuerzburg, Germany :
Dass Gotthard-Unternehmen. Eine zusammenstellung der wichtigsten projects in technischer und finanzieller beziehung. F. Rinecker, München. 1878.
- From the Royal United Service Institution, London :
Journal of the Institution, No. XCIV. 1878.
- From H. Sermour, Jr., Albany, N. Y. :
Report of the State Engineer on the Canals of New York. 1877.
- From William B. Sherman, New Bedford, Mass. :
Eighth Annual Report of the Acushnet Water Board, New Bedford. December, 1877.
- From T. E. Sickels, New York :
Report to Stockholders of Union Pacific Railroad. 1877.
- From William Sooy Smith, Maywood, Ill. :
Specifications for masonry and for superstructure of the Glasgow Bridge. W. Sooy Smith. 1878.
- From the Society of Engineers, London :
Transactions for 1877.
- From Adjt-Gen. W. S. Stryker, Trenton, N. J. :
Record of Officers and Men of New Jersey in the Civil War, 1861-1865. 2 vols. Trenton. 1877.
- From the Swedish Society of Engineers, Stockholm :
Record of the Society. 12th part. 1877.
- From A. H. Thurston, Hoboken, New Jersey :
Application of electricity to regulation of railway traffic. F. L. Pope, Hartford. 1878.
- From John D. Van Buren, New Brighton, N. Y. :
Annual Report of the State Engineer on the Canals. 1877.
- From H. D. Whitcomb, Richmond, Va. :
Annual Report of the James River Improvement Committee to the City Council with report of the Engineer. 1878.

ANNOUNCEMENTS.

In the London "Building News and Engineering Journal" of July 5th, 1878, there is an extended abstract of the paper by Edward S. Philbrick, member of this Society, on the improvement of the South Boston Flats by the Harbor Commissioners of the State of Massachusetts, which was published in these Transactions as No. CLV, of Vol. VII, February, 1878.

An interesting manuscript description of the improvement of the Upper Seine and Yonne Rivers, by William Lucien Scailfe, Civil Engineer, has been loaned to the library of the Society. Included in the monograph is a statement of the extent of inland navigation, both by canals and river improvements, in France, and an historical outline of its development. There are also very full descriptions of the different kinds of movable dams, with details of their construction and management. The methods of artificial floods and of continuous navigation are compared. Descriptions are given of the methods of transport in use, especially of towing by

means of a sunken chain. Details of the cost of various improvements are given, and forms of the hydrometric and meteorological reports.

"London Engineering" of July 26th, 1878, reprints paper CL, Transactions of this Society (Vol. VI, October, 1877), "Description of Survey for determining the Slope of Water Surface in the Erie Canal," by William H. Searles.

"The London Iron" of July 27th, 1878, reprints paper CLVII, Transactions of this Society (Vol. VII, March, 1878), "Steam Engine Economy; a uniform basis for comparison," by Charles E. Emery.

In the "Annales des Ponts et Chaussées" for February, 1878, is printed a translation of paper CXXXIX, Transactions of this Society (Vol. VI, April, 1877), "The consumption and waste of water delivered by public works," by James H. Harlow.

The following reports and papers are at the Society rooms for distribution among such members as apply for them, sending at the

same time stamps for the prepayment of postage. It will be sufficient to note the numbers attached to each, which are in continuation of the list in Proceedings, Vol. III, page 78, July, 1877:

8th Report of the Improvement of the South Pass of the Mississippi River. Capt. M. R. Brown, Corps of Engineers, U. S. A. [29.]

9th Report of the Improvement of the South Pass of the Mississippi River. Capt. M. R. Brown, Corps of Engineers, U. S. A. [30.]

Report of Chief Engineer Board of Public Works of Jersey City. L. W. Post. [31.]

Report of the Committee of Engineers' Club of Philadelphia, on the Metric System of Weights and Measures. [32.]

Report of progress of work on the Cincinnati Southern Railway. [33.]

The strength of wrought-iron, as affected by its composition and by its reduction in rolling. A. L. Holley. [34.]

An investigation as to the mode and amount of attraction between large and small bodies in contact or at small distances. S. Whipple. [35.]

The Hayford process and apparatus for preserving timber. E. R. Andrews. [36.]

Report of the trial of the steam machinery of the United States Revenue Cutter "Gallatin." [37.]

If postal orders are made use of in transmitting money to the Treasurer or Secretary, care should always be taken to send at the same time the full name of the person to whose order it is drawn, with official title, if any such is given at the time of obtaining the order. This information is absolutely required to secure the payment of an order at the New York Post Office.

A photograph was taken of the members of the Society during their recent visit to Lowell on June 21st. Any person desiring a copy can obtain it by sending his address to Mr. James B. Francis, Lowell, Mass. Price \$1.00.

DISCORDANT STANDARDS OF MEASUREMENT.

A number of members of the Society desire to obtain for publication, statements of the various discordant standards of measure in use in the United States. It is known that in many cities the old standards are more or less at variance with the present, and that, quite frequently, confusion and annoyance are the result. A table, compiled from the information which is undoubtedly in the possession of members of the Society, would be both interesting and valuable. The request is, therefore, made, that any information

which would be of assistance in the preparation of such a table be forwarded to the Secretary. The replies should state the equivalent of the measures referred to in U. S. standard feet or in meters, together with any additional notes which may be applicable. If provisional equivalents, afterwards proving incorrect, have been adopted, the value of these should also be stated.

MEMBERS who desire to secure complete sets of the Transactions of the Society are requested to send to the Secretary a list of the papers which are needed to fill up their sets. Some of the earlier papers are out of print. If orders are received for a sufficient number to warrant the expense, a reprint will be made.

SPECIAL attention is called to the code of rules for award of the Norman Medal, printed at the end of this number. Papers for competition must be submitted previous to September 6th, 1878. All members of the Society are invited to assist in securing the presentation of papers for this award.

MEMBERS of the Society who expect to visit Europe during the present year, are requested to inform the Secretary as soon as possible of that fact, and also of the time when they purpose leaving and the probable length of their stay abroad, together with their European address.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, That Members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

THE Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election

FIRMSTONE, FRANK.....	Glendon Iron Works, Easton, Pa.....	Aug. 7th, 1878
NICHOLSON, GEORGE B....	Engineer's Office, Cin. Southern Railway, 70 West 3d Street, Cincinnati, Ohio....	May 1st, 1878
NICOLLS, WM. J.....	Engineer Taylor Iron Co., 91 Liberty St., New York.....	June 5th, 1878

CHANGES AND CORRECTIONS.

MEMBERS.

BOGUE, VIRGIL G.....	Care of Charles Watson, Lima, Peru.	
CROES, J. JAMES R.....	Eng. Additional Water Supply, Newark, N. J.	
DAVIS, CHAS. E. L. B....	Capt. of Engineers, U. S. A., Box 900, Galveston, Texas.	
EARLEY, JOHN E.....	Asst. Eng. Tenn. River Improvement, Florence, Alabama.	
MCGEE, JOHN.....	Steubenville, Ohio.	
PRINDLE, F. C.....	Civil and Mechanical Engineer, 204 Walnut Place, Philadelphia, Pa.	
VAN WINKLE, E. B.....	Topographical Engineer Dept. Public Parks, 56th Street and Broadway, New York.	
WELLMAN, D. W.....	Asst. U. S. Eng. in charge Missouri River Survey, 1351 Washington Ave., St. Louis, Mo.	
WISNER, GEORGE Y.....	252 Park Street, Detroit, Mich.	

American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV, June, 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

AUGUST 7TH, 1878.—The Society met at 8 p. m., William E. Worthen in the chair.

The ballot upon admission to membership was canvassed, and Frank Firmstone, of Easton, Pa., was declared elected as Member. The following resolution was offered by John W. Hill, and being duly seconded, was, in accordance with the rule, referred to the Board of Direction :—

Resolved, That a committee of five be appointed by the President to investigate and report upon the conditions calculated for maximum economy in the use of steam in steam engines.

The death on July 9th, 1878, of C. Ridgely Schott, member of the Society, was announced, and J. J. R. Cross and John Bogart were appointed a committee to prepare a memoir of the deceased.

AUGUST 21ST, 1878.—The Society met at 8 p. m., John C. Campbell in the chair.

An addition to the paper by Theodore Cooper, entitled, "Observations on the Stresses Developed in Metallic Bars by Applied Forces," was read by the Secretary, and discussed by Messrs. Bogart, J. C. Campbell, Chanute, Emerson, Striedinger and Van Winkle.

REPORTS OF COMMITTEES PRESENTED AT THE TENTH ANNUAL CONVENTION.

REPORT OF THE COMMITTEE ON TESTS OF AMERICAN IRON, STEEL AND OTHER METALS.

PRESENTED FOR THE COMMITTEE BY WILLIAM SOOY SMITH, CHAIRMAN.

Your Committee on Tests of American Iron, Steel and other Metals, offers for your consideration the following brief statement of its action during the interval that has elapsed since the date of its last report, and such remarks as naturally suggest themselves at this time touching the very interesting and important subject entrusted to its care.

During the month of April last, the chairman of your committee visited the national capitol and presented the claims of the United States Testing Board for the additional appropriations required for the continuance of its work. The inquiry was constantly made, "What has the Board already done, and what is it now doing with the money already appropriated?" Without a full and satisfactory answer to this inquiry, members of Congress were naturally unwilling to favor any further appropriation of money for the use of the Board. And in order that this information might reach Congress through the proper channel, a resolution was introduced in the House of Representatives, and passed, calling upon the President of the United States, to whom the Testing Board makes its reports, to inform Congress what had been done by this Board. It is understood that this information will soon be laid before Congress, when it will appear to the Congress and people of the United States, that a great deal of most valuable work has already been done by the Board, and that the investigation for which it was created, and which it has planned and undertaken, is of exceeding value to all classes of our people, and especially to the engineers, architects, mechanics, manufacturers and railroad men, not only of this country, but of the whole world. If the Board is only permitted and enabled to carry forward its examination of the steels produced by the Bessemer, Siemens-Martin, and other new processes, the knowledge obtained will be worth ten times the cost of the entire investigation which it has planned. The same may be said of nearly every branch of the enquiry marped out. To no men in the United States is this better known than to

those to whom this report is addressed. Your committee doubt not that every engineer in the land desires to have our iron and steel tested in the exact sizes and shapes in which these metals are used in bridges and other structures. It is surely essential that we should know the right values of the constants which enter the formulas we employ in determining the strength of the various members which make up our structures. And is there one of us who can say what value we should assign to those which enter Gordon's or Rankine's formulas for calculating the strength of long columns to resist compression?

Several appropriations have been made—a board has been appointed and is at work—a testing machine is ready for the use of the Board, which is, or ought to be, the finest one ever constructed in this or any other country. A plan for the entire investigation has been devised which has met with the hearty approval of Engineers of this and other countries. The work is well begun—the necessity of its faithful prosecution and completion is apparent to all. If the government shrinks from the expenditure of the small sum necessary to carry forward this work, and the Board is permitted to pass out of existence, in accordance with the provision of an existing Act of Congress, when and how can the knowledge we so much need ever be obtained, and what shall we, as Engineers do without it, in the presence of the demands made upon us to construct works in the new materials offered for our use, and in shapes which we desire to use, but cannot, for want of correct knowledge as to their strength and behavior.

Unless Congress can be influenced to repeal the clause legislating the Board out of existence, and to appropriate the sum (say ten thousand dollars) necessary to enable the Board to go on with its work, from year to year, until it is done, the Board will cease to exist before another annual meeting of our Society. The testing machine which has been built for its use, will pass into the possession

of a government bureau, our profession and the country will be left to grope in the midst of the ignorance which exists, and suffer a lasting and poignant regret that a most deserving work should be permitted to fall, which has been so auspiciously begun.

The American Society of Civil Engineers, and many engineering schools, clubs and societies throughout the country, as well as colleges, mechanical institutes, The American Institution of Mining Engineers, The Iron and Steel Association, and many distinguished engineers, architects and manufacturers have testified to the need of the investigation, and

the thoroughness of its plan. The further action which your committee recommends, and it does so most earnestly, is the immediate use of every bit of personal influence which any member of our Society possesses to procure favorable action on the part of the committees on appropriations of the United States Senate and House of Representatives on the application made in behalf of the Board by your committee, for the appropriation of ten thousand dollars for the current expenses of the United States Testing Board during the next fiscal year.

REPORT OF THE CENTENNIAL COMMISSION.

PRESENTED BY THEODORE G. ELLIS, CHAIRMAN.

The duties assigned to the Centennial Commission have all been completed, with the exception of preparing memoirs upon the various branches of Engineering exhibited at the Centennial Exposition. The preparation of these memoirs was assigned to sub-committees, only two of which have yet reported. The memoirs upon Light-house Engineering and upon Rivers and Harbors, have already been presented to the Society. It is hoped that the others are in preparation, and will soon be presented. Although it is a severe tax upon the time of the gentlemen to whom

the duty has been assigned, it is a work for which they have been selected on account of their eminent fitness, and as it is a matter of great importance to the Society to retain a record of the interesting exhibit it presented, it is believed that these memoirs will be presented as soon as time can be spared to prepare them.

The commission still desires and hopes that a nearly complete set of these memoirs will be prepared, and it would be well to continue it until the several sub-committees have reported.

REPORT OF THE COMMITTEE ON PERMANENT QUARTERS FOR THE SOCIETY,

PRESENTED BY F. COLLINGWOOD, FOR THE COMMITTEE.

The Committee reports that the lease of the house now occupied by the Society extends to May 1st, 1879. While there are certain inconveniences in the use of the present quarters, it will probably not be advisable to incur the

expense of a removal, unless very decided advantages can be gained thereby. Should the Committee be continued, it will suggest to the Society any opportunity which may become available for permanent improvement.

REPORT OF THE COMMITTEE ON GAUGING OF STREAMS.

PRESENTED FOR THE COMMITTEE BY J. J. R. CROES, CHAIRMAN.

The Committee can only report that the hopes which they were led to entertain at the date of the last report, in November, have not been fulfilled; that no interest seems to have been taken by any persons in the matter, and that the two departments of New York City, which we had reason to think would give the results of observations, have failed entirely to respond. The Commissioner of Public Works has stated that the results of gaugings of the flow of the Croton river, continuous for the last two or three years would be published in the first quarterly report for 1878. That re-

port has appeared, and there is nothing in it about it.

The Commissioners of Parks, who gave reason to believe that they would engage in the gauging of the streams in Westchester, in Wards 23 and 24 of New York, on finding that the necessary preparations for such gaugings would cost between two and three hundred dollars, laid the matter over indefinitely, and the Committee can only report that no progress has been made, much to their regret.

LIST OF NEW BOOKS ON ENGINEERING AND TECHNOLOGY.

- Alphabets, Book of.** For Painters, Draughtsmen, Designers, &c. Including all standard styles and many new and popular ones. Among others, German, French, Old English, &c. Jesse Hauey. New York. *Am. News Co.* \$0.50.
- Astronomy.** The main facts of popular — and Mathematical Geometry. J. R. Laugler. London. 12mo, 2d ed. *Simpkin*. 1s.
- Bridge.** The Illinois and St. Louis —; by Prof. C. M. Woodward. Washington University S. L. Louis. This work is undertaken at request of Capt. Eads, and all questions of fact will be endorsed by him. Fully illustrated (Announcement)
- The proposed Tower —. Observations to prove that a New Bridge east of London Bridge is unnecessary. With Returns, showing the Traffic of London Bridge to be much decreased. Peter W. Barlow. London. 8vo. *Spon*. 6d.
- Canal and Culvert Tables.** Louis D'A. Jackson. London. W. H. Allen & Co. (Announcement)
- Carpentry and Joinery:** Tredgold's and Tam's Atlas to. (Weale's series.) London. 4to, 2d ed. *Crosby Lockwood*. 6s.
- Casting and Founding.** A practical Treatise, with descriptions of modern machinery employed. R. E. Spretton. London. 8vo, plates. *Spon*. (Announcement)
- Chemistry.** Elements of —, Theoretical and Practical. Part 2. Inorganic Chemistry. W. A. Miller. London. 8vo. *Longmans*. 21s.
- Handbook of Modern Chemistry. Inorganic and Organic. C. M. Tidy. London. 8vo. *Churchill*. 16s.
- Civil Service Commission.** Table of Rules and Regulations respecting Examinations for the Home Civil Service, the Army, the Civil Service of India, &c. 8vo. *British Government Publications*. 1s. 6d.
- Cotton Manufacturers', Managers' and Spinners' New Pocket Guide,** containing Examples of the various calculations connected with the Machinery of a Cotton Mill, with rules to find the speed of any shaft, drum, spindle, or roller connected with Machinery. John Moss. Manchester. 12mo. *Heywood*. 3s. 6d.
- Drawing.** The parallel and meridian system of map drawing in connection with a ruler for making the parallels and meridians, whether straight or curved. W. V. Marshall. New York. 4to. *Barnes*. \$0.20
- Energy.** The Conservation of —, An elementary treatise on —, and its laws. Balfour Stewart. London. Post 8vo, new ed. *C. K. Paul*. 5s.
- Engineering Field Work.** 2d ed. Revised, with additions and a supplementary volume on Waterworks. W. Davis Haskell. London. 8vo. *Crosby Lockwood*. 25s.
- Examinations, Complete Guide to the Standard —,** consisting of twenty-four entire sets of paper on Arithmetic, with examples on other subjects. J. Heywood. London. 12mo (Announcement.)
- Geology.** Elementary. E. B. Andrews. Cincinnati. 12mo. *Van Antwerp, Bragg & Co.* \$1.00.
- Handbook to the Principal Professions,** based on the most recent Regulations Concerning Admission to the Navy, Army, and Civil Services (Home and Indian); the Legal and Medical Professions; the Professions of a Civil Engineer, Architect, and Artist, and the Mercantile Marine. C. E. Pascoe. London. Post 8vo. *Low*. 3s. 6d.
- Hydrostatics of the Eastern Drain and Sewer.** T. Morris. London. 12mo. *Siddkin*. 6d.
- Kew.** Report on the Progress and Condition of the Royal Gardens at Kew during the year 1877. Post 8vo. *British Gov't Publications*. 6d.
- Lectures on the Labor Question.** Thomas Brassey, M. P. 3d ed. London. 8vo. *Scribner & Welford*. New York. \$3.00.
- Mensuration and Measuring.** T. Baker. New ed., rev. by E. Nugent. (Weale's Series.) London. 12mo. *Crosby Lockwood*. 1s. 6d.
- Microphone, The —** With notes on the Telephone and Phonograph. Alex. Watt. London. 32mo. *Hurston*. 6d.
- Mint, The —** of the United States; a handbook of information as to how our coins are made. Wm. M. Ruukle. Philadelphia. 8vo. *S. T. Soder*. \$0.25.
- Ornament—Designers' and Draughtsmen's Handbook of.** With 112 illustrations; explaining the various styles of Decoration. W. Gibbs. London. *Dean & Son*. 1s.
- Palmer's Manual.** Jesse Hauey. New York. *Am. News Co.* \$0.50.
- Paris Universal Exhibition of 1878.** Victoria, Australia. Official Catalogue of Exhibits. Post 8vo. London. *Burt*.
- Philosophy—Lechanel's Natural.** An Elementary Treatise. Trans. and extended by J. D. Everett. London. 8vo., illus. *Blackie & Son*. 18s.
- Physics —.** Questions and Problems in Elementary Physics, cont. numerous practical examples and exercises. C. L. Hotze. St. Louis. 12mo. *Central Pub. Co.* \$0.75.
- Punkahs—**On the Working of, in India, as at present carried out by coolie labor, and the same operation effected by machinery. R. C. Parsons. London. 8vo. *Spon*. 1s.
- Railroads: their Origin and Problems.** Charles F. Adams, Jr. New York. 12mo. *Pulnam*. \$1.25.
- Rainfall.** Distribution of Rain over the British Isles during the year 1877, as observed at about 2000 stations in Great Britain and Ireland. G. J. Symons. London. 8vo. *Stanford*. 5s.
- Rocks—Classified and Described; A Treatise on Lithology.** (Berghard Van Cotta) An English edition, by Philip Henry Lawrence, with English, German and French Synonyms. Revised by the Author. New ed. Post 8vo. *Longmans*. 14s.
- Sewerage.** Short History of the Wolverhampton; with a few hints on the Ventilation of House Drainage. G. J. C. Broom. London. 8vo. *Spon*. 1s. 6d.
- Technical Manuals, Cassell's.** Illustrated throughout with Drawings and Working Diagrams, bound in cloth. London. *Cassell, Pitter & Galpin*.

Bricklayers, Drawing for. 3s.
 Building Construction. 2s.
 Cabinet-Makers, Drawing for. 3s.
 Carpenters and Joiners, Drawing for. 3s. 6d.
 Gothic Stone Work. 3s.
 Linear Drawing and Practical Geometry. 2s.
 Linear Drawing and Projection. The two volumes in one. 3s. 6d.
 Machinists and Engineers, Drawing for. 4s. 6d.
 Metal-Plate Workers, Drawing for. 3s.
 Model Drawing. 3s.
 Orthographical and Isometrical Projection. 2s.
 Practical Perspective. 3s.
 Stonemasons, Drawing for. Cloth. 3s.
 Applied Mechanics. Cloth. 2s.
 Color. With colored plates. 2s. 6d.
 Systematic Drawing and Shading. 2s.
 Timber and Log Book, Ready-Reckoner and Price Book. O. Byrne. New York. Am. News Co. \$0.25.
 Tramways Intelligence; A Short History, compiled from Official Sources, of the

Principal Tramway and Omnibus Companies. With Useful Tables for Investors. Second year of issue. 8vo. *E. Wilson*. 1s. 6d.
 Valve Gears. Slide ——. A new graphical method for analyzing the action of slide valves moved by eccentrics, link-motions and cut-off gears: offering easy means for designing valves and valve-gears, and for establishing the comparative merits of their various constructions. Hugo Bilgram. Philadelphia. Claxton, Remsen & Haffelfinger. \$1.00.
 Villages and Village Life. with Hints for their Improvement. Nathaniel Hillyer Eggleston. Post 8vo. New York. Harper & Brothers. \$1.75.
 Water; Its Physical Properties, Sources, Distribution over the Earth, and Uses for Engineering and Sanitary Purposes. Prof. D. P. Ansted. London. *W. H. Allen & Co.* (Announcement.)
 White Mountains — Stereoscopic Views; with descriptive text. illus. by the Albotype process (with lens attachment). New York. 12mo. Harroun & Bierstadt. \$3.00.

ADDITIONS TO

LIBRARY AND MUSEUM.

From American Iron and Steel Association. Philadelphia:
 Annual Report of the Secretary. July 15, 1878.

From C. A. Angstrom, Stockholm, Sweden:
 Experiences de force et de traction sur des tôles suédoises produites par des procédés divers. Stockholm. 1878.

From the Argentine Scientific Society, Buenos Ayres:
 Annals of the Society. Vol. III, 1877, and July, 1878.

From J. B. Bachelder, Washington:
 Information as to preparation of the Engineer Maps of the Gettysburg battle-field, Washington. 1878.

From John Bogart, New York:
 Original plates of three bridges erected near Philadelphia in 1813 by L. Wernwag.

From Boston Public Library:
 Twenty-sixth Annual Report of Trustees. Boston: 1878.

From A. D. Briggs, Springfield, Mass.:
 Report of Water Commissioners of Springfield. 1878.

From Civil Engineers' Club of the Northwest. L. P. Morehouse, Secretary. Chicago:
 Proceedings of the Club. Vol. III. Chicago. 1878.

From Claxton, Remsen & Haffelfinger, Philadelphia:
 Slide Valve Gears—a new practical method for analyzing the action of Slide Valves moved by Eccentric, Link-motions and Cut-off Gears. Hugo Bilgram. Philadelphia. 1878.

From Eckley B. Cox, Drifton, Pa.:
 Address delivered before the Alumni Association of Lehigh University. E. B. Cox. Philadelphia. 1878.

From Daniel Draper, New York:
 Annual Report Meteorological Observatory. 1877. Daniel Draper. New York. 1878.

From James B. Eads, St. Louis:
 Review of letter of Gen. A. A. Humphreys to Hon. E. W. Robertson. James B. Eads. Washington. 1878. (3 copies.)

From Albert Fink, New York:
 Are the New York Railroads discriminating against the Commerce of New York City. Albert Fink. New York. 1878.

From B. M. Harrod, New Orleans:
 Report of Board of Engineers on New Orleans Harbor. New Orleans. 1878.

From Rudolph Hering, Philadelphia:
 Bearing Piles. R. Hering. Chicago. 1878.

From Clemens Herschel, Boston:
 On the erosive and abrading Power of Water upon the sides and the bottom of Rivers and Canals. Clemens Herschel. Philadelphia. 1878. (Copies for distribution.)

From Julius E. Hilgard, Washington:
 Report of the Superintendent United States Coast Survey, 1875. Hon. C. P. Patterson. Washington. 1878.

From Gen. A. A. Humphreys, Washington:
 Instructions for observing the total Solar Eclipse of July 29th, 1878. Washington. 1878.

Ninth Report of Improvement of South Pass of Mississippi River. M. E. Brown. Washington. 1878. (Copies for distribution.)

From Institute of Civil Engineers, James Forrest, Secretary. London:
 Abstract of Papers in foreign Transactions and Periodicals. Vol. III. Part 3. Session 1877-1878. London. 1878.

The Centrifugal Pump. Wm. C. Unwin. London. 1878.

Chemical and Physical Analysis of Phosphoria Steel. A. L. Holley. London. 1878.

- Direct Acting or Non-Rotative Pumping Engines and Pumps.** Henry Day. London. 1878.
- The drainage, irrigation, and cultivation of the Albufera of Alcudia, Majorca; and application of the Common Reed as a material for paper.** H. B. Waring. London. 1878.
- On the main Drainage of Paris and the utilization of its Sewage.** Felix Target. London. 1878.
- The Egremont Ferry Landing.** Wm. Carson. London. 1878.
- On the Flow of Water through Level Canals.** James A. Longridge. London. 1878.
- The Huevia Pier of the Rio Tinto railway.** Thomas Gibson. London. 1878.
- Machine Tools.** P. K. Allen. London. 1878.
- Minutes of the Institution of Civil Engineers.** With other selected and abstracted papers. Vol. LII. Part II. London. 1878.
- Note on the Ventilation of Mount Cenis Tunnel.** Wm. Pole. London. 1878.
- Notes on Railway Appliances, at the Philadelphia Exhibition of 1876.** Douglas Galton. London. 1878.
- The Steam Navy.** C. D. Fox. James Brand, H. M. Whitley, and C. A. Harrison. London. 1878.
- On the Strength of Flat Plates and Segmental Ends of Boilers and other Cylinders.** Daniel K. Clark. London. 1878.
- From the Iron and Steel Institute, Julien Deby, Secretary.** London: *Journal of the Institute.* No. 1. London. 1878.
- From Charles Latimer, Cleveland:**
Comparative Statement of Expenses in Engineer Department, Atlantic and Great Western Railway, April, 1877-78. Charles Latimer. Cleveland. 1878.
- From Wm. H. Lotz, Chicago:**
Reports United States Coast Survey, 1865, '66, '67, '68, '69, '70, '71, '72, '73. Washington. **Theoretical-Practical Handbook of the manufacture of Pig Iron (German).** B. Valerius. Freiberg. 1851.
- From Charles Macdonald, New York:**
Exposition des Ponts construits par Delaware Bridge Company. Paris Exhibition. Chas. Macdonald. New York. 1878.
- Illustrated Album, Delaware Bridge Company.** Charles Macdonald. New York. 1878.
- From Wm. H. McFadden and Charles G. Darrach, Philadelphia:**
Plans of Philadelphia Water Department. Wm. H. McFadden and Charles G. Darrach. Philadelphia. 1878.
- Topographical Map of Philadelphia, showing Water Mains and Street Grades.** Wm. H. McFadden and Charles G. Darrach.
- From Wm. J. Nicolls, New York:**
The Railway Builder. Wm. J. Nicolls. New York. 1878.
- From Ernest Pontzen, Paris:**
Ciments Portland. Notice sur les Chaux Emiettements Hydrauliques de Lafarge. MM. L. et E. Pavin de Lafarge. Paris. 1878.
- Compagnie Française Ciment de Grenoble.** Moreau, Porteret, Berethelot & Cie. Paris. 1878.
- De l'emploi des Chaux et des Ciments Portland.** Lafarge, L. and E. Pavin de Lafarge. Paris. 1878.
- Der Bau des Spitzberg-Tunnels auf der Pilsen-eisenstein-bahn.** Aloise Stane und Carl Pascher. Berlin. 1878.
- Excavateur pour grands Travaux de Terrassements, Ports, Canaux, Franchées, etc.** A. Couvreur. Paris. 1878.
- Exposition Universelle à Paris. Notice sur les Modeles, Cartes et Dessins relatifs aux travaux des Ponts et Chaussées réunis par les soins du ministère des travaux publics.** Paris. 1878.
- Le Grand Ballon Captif à vapeur.** Henry Gifford. Paris. 1878.
- Technischer Bericht zum Projekte für die Marenfeld Bewässerung.** J. von Podhasky. Vienna. 1878.
- Usine de Frangey Quillot Frères fabricants à Frangey, par Lezigneux.** Paris. 1878.
- From Francis Rinecker, Würzburg:**
Specifications of Pennsylvania Company, General form of Construction Contract.
Specifications of Pennsylvania Company, Grubbing, Clearing and Grading.
Specifications of Pennsylvania Company for Stone Masonry.
- From Royal United Service Institution, B. Burgess, Secretary.** London: *Journal of the Institution.* Vol. XXII, 1878, No. XCV. London.
- Journal of the Institution.* Vol. XXII, 1878, No. XCVI, London.
- Appendix to Vol. XXI of the Journal of the Royal United Service Institution.** London. 1878.
- From Hon. Horatio Seymour, Jr., Albany:**
Annual Report of State Engineer and Surveyor. H. Seymour, Jr. Albany. 1878.
- From Société des Ingenieurs Civils, Paris:**
Transactions of the Society. January and February, 1878. Paris.
- From B. H. Thurston, Hoboken:**
Results of a Series of Tests of Cold-Punched and Hot-pressed Nuts—a Report. B. H. Thurston. Philadelphia. 1878.
- The Flow of Metals.** David Townsend. Philadelphia. 1878.
- Report of New Jersey State Commission appointed to devise a plan for the Encouragement of Manufactures of Ornamental and Textile Fabrics.** Trenton, 1878.
- From J. Nelson Tubbs, Rochester:**
Annual Report of the Executive Board of Water Works of Rochester. Rochester, 1878.
- From U. S. Light House Board, Washington:**
New List of Buoy, Towers, Beacons, Stakes and other day marks in the Third Light House District. Corrected to July, 1878. Washington, 1878.
- From George T. Walch, Madras, India:**
Notes on some of the chief navigable rivers and canals in the United States and Canada. George T. Walch. Madras. 1878.
- From William H. Wiley, New York:**
Tunnelling. Explosive Compounds and Rock Drills. Henry S. Drinker. New York, 1878.
- From other Sources:**
Papers on subjects connected with the duties of the Corps of Royal Engineers. Vols. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. London. 1847.
- Opinion of the U. S. Circuit Court, District of Massachusetts. In the case of the Atlantic Giant Powder Company vs. George A. Good-year, and the same vs. George W. Townsend.** New York, 1878.
- Record on motion for Interlocutory Injunction.**

tion in the case of The Atlantic Giant Powder Company vs. George A. Goodyear. Boston, 1877.
Specification for the McAdamizing of the Flushing and North Hempstead Turnpike,

in the Town of Flushing, Queens Co., N. Y., 1878.
Specifications and proposal for Asphaltum Pavements. Washington, 1878.

ANNOUNCEMENTS.

The Twenty-sixth Annual Meeting of the Society will be held Wednesday, November 6th, 1878, at 10 A. M.

In Vol. LIII, Session 1877-8, part 3, of the abstract of papers in Foreign Transactions and Periodicals, published by the Institution of Civil Engineers, London, and edited by James Forrest, Secretary, there are abstracts of the following papers from Transactions of this Society:

Notes and experiments on the use and testing of Portland Cement, by W. W. MacLay (No. CLII, Vol. VI, December, 1877).

Igniting Blasts by means of Electricity; by Julius H. Striedinger (No. CLIII, Vol. VII, January, 1878).

The Improvement of the South Boston Flats; by Edward S. Philbrick (No. CLV, Vol. VII, February, 1878).

On a new method of detecting overstrain in Iron and other metals; by Robert H. Thurston (No. CLVI, Vol. VII, March, 1878).

The next regular meeting of the American Institute of Mining Engineers will be held at Lake George, October 15th, 1878.

MEMBERS who desire to secure complete sets of the Transactions of the Society are requested to send to the Secretary a list of the papers which are needed to fill up their sets. Some of the earlier papers are out of print. If orders are received for a sufficient number to warrant the expense, a reprint will be made.

SPECIAL attention is called to the code of rules for award of the Norman Medal, printed at the end of this number. Papers for competition must be submitted previous to September 6th, 1878. All members of the Society are invited to assist in securing the presentation of papers for this award.

ALL persons who desire a copy of the Bill now pending before Congress, to amend the Statutes in relation to Patents, should send their address to W. C. Hill, clerk of Senate Committee on Patents, Washington, D. C., who will immediately forward the same.

If postal orders are made use of in transmitting money to the Treasurer or Secretary, care should always be taken to send at the same time the full name of the person to whose order it is drawn, with official title, if any such is given at the time of obtaining the order. This information is absolutely required to secure the payment of an order at the New York Post Office.

A photograph was taken of the members of the Society during their recent visit to Lowell on June 21st. Any person desiring a copy can obtain it by sending his address to Mr. James B. Francis, Lowell, Mass. Price \$1.00.

DISCORDANT STANDARDS OF MEASUREMENT.—A number of members of the Society desire to obtain for publication, statements of the various discordant standards of measure in use in the United States. It is known that in many cities the old standards are more or less at variance with the present, and that, quite frequently, confusion and annoyance are the result. A table, compiled from the information which is undoubtedly in the possession of members of the Society, would be both interesting and valuable. The request is, therefore, made, that any information which would be of assistance in the preparation of such a table be forwarded to the Secretary. The replies should state the equivalent of the measures referred to in U. S. standard feet or in meters, together with any additional notes which may be applicable. If provisional equivalents, afterwards proving incorrect, have been adopted, the value of these should also be stated.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, That Members be requested, in papers hereafter presented to the Society, to

write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

In reference to the foregoing resolution, a member of the Society, now in Europe, writes as follows:

I should like to draw the attention of members of the Society to a small instrument for the easy reduction of figures to the different standards. This is the sliding rule, invented by Gunter, in London, in 1624. Improved by Seth Partridge, in 1657, it came into use in the establishment of Boulton & Watt, at Soho, under the name of the Soho Rule. About thirty years ago, it was further improved by A. Mannheim, in France, by the addition of the *courseur*. Although the rules have various uses, they are of special value for the transformation of dimensions, weights, etc., from

one to another standard; the rule making tables with their chances of misprints superfluous, only the reciprocal value of the units being required for its use.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

THE Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.

LIST OF MEMBERS.

ADDITION.

MEMBER.

Date of Election.

CLARKE, ELIOT C. Prin. As't Engineer in charge of Improved Sewerage, 74 Tremont St., Boston, Mass. Sept. 4th, 1878

CHANGES AND CORRECTIONS.

MEMBERS.

ALDRICH, JAMES C. North Scituate, R. I.
CHITTENDEN, S. H. As't Eng. Elk River Shoals, Decatur, Alabama.
CORTHELL, E. L. Res. Engineer, South Pass Jetties, 383 Friendship St., Providence, R. I.
HARLOW, JAMES H. Prin. As't Eng. Davis Island Dam, Box 70, Pittsburgh, Pa.
HILL, JOHN W. Mechanical Engineer, S. E. cor. Fifth and Walnut Sts., Cincinnati, Ohio.
WARFIELD, A. G., Jr. Assistant State Engineer, San Francisco, Cal.

JUNIORS.

CLAY, GEORGE E. 7 West Forty-fifth Street, New York.
MERRIMAN, MANSFIELD. Prof. Civil and Mechanical Engineering, Lehigh University, Bethlehem, Pa.
WHINERY, SAMUEL. As't Eng. U. S. Engineer Corps, Elk River Shoals, Decatur, Alabama.

RESIGNATION.

HAMILTON, SCHUYLER. Member Sept. 4th, 1878.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV., July,* 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 4TH, 1878.—The Society met at 8 p. m. O. Chanute in the chair.

The ballots upon admission to membership were canvassed, and declared George D. Ansley, of Montreal, Canada, and Eliot C. Clarke, of Boston, Mass., were declared elected members.

A paper by D. McN. Stauffer, entitled "Fall of the Western Arched Approach to South street Bridge, Philadelphia," was read by the Secretary and discussed by Messrs. Chanute, Emery, North, Schuyler, and Bogart.

SEPTEMBER 18TH, 1878.—The Society met at 8 p. m., M. N. Forney in the chair.

A letter from Thomas H. Johnson, describing Asphalt Pavements laid in Columbus, Ohio, and the results of traffic upon them, was read by the Secretary.

A statement as to the process of construction and method of laying

* The minutes of meetings are carried in this number up to November 6th, 1878. The fact that November proceedings are published in a number headed July is explained in the Annual Report of the Board of Direction. When the Board for the current year took office in November, 1877, the number of Transactions headed September, 1877, was the last that had been published. During the year as many numbers have been published as it was possible to do, and at the same time pay off the large accumulation of debt which was found to exist against the Society. The present number makes ten issues during the year, instead of twelve. As the Society is now entirely out of debt, it is purposed to make up the lacking numbers with the least possible delay.

various asphaltic pavements in the City of New York, including the Grahamite pavement on Fifth avenue, a road pavement in the Central Park, the Neuchatel rock pavement in Union square, and an asphaltic block pavement in Twenty-second street, was read by John Bogart.

A description of asphaltic pavements in Paris, and of a preserved wood block pavement laid in Boston, was given by Edward R. Andrews.

An asphaltic block pavement laid in Philadelphia was described by Edward P. North. A coal-tar pavement laid in Brooklyn, which has lasted a number of years, was described by Thomas P. Kinsley; and a pavement of coal-tar and stone, near Oxford, England, which has also stood many years, was referred to by David N. Melvin.

A pavement laid in Liverpool, of granite blocks, with gravel and pitch in the interstices, and covered to the depth of one inch with the same material, was described by George W. Dresser.

The subject of pavements was then generally discussed.

OCTOBER 2D, 1878.—The Society met at 8 P. M., John C. Campbell in the chair.

The ballots for admission to membership were canvassed, and the following candidates were declared elected as members: Fred. P. Stearns, of South Framingham, Mass.; Marshall M. Tidd, of Lewiston, Me.; Frederick M. Wilbor, of Chatham, N. Y.

The ballot upon the following resolution was canvassed: "Resolved, That a committee of five be appointed by the President, to investigate and report upon conditions calculated for maximum economy in the use of steam in steam engines."

There were in favor of this resolution 38 votes, and against it 62 votes. The resolution was thereupon declared lost.

A report from the Board of Direction was read, as follows:

"The Board of Direction, having considered the resolutions and By-Laws relating to duties of officers, which have been referred to it, is of the opinion that, in the present condition of the Constitution and By-Laws, such amendments as have been proposed would only add to the existing confusion.

"It is of the opinion that the only method by which order can be brought out of the existing law is by a revision and codification of the Constitution and By-Laws."

A codification* of the present Constitution and By-Laws, not changing their provisions, but re-arranging and condensing the original provisions and adopted amendments, was then, in accordance with the above report, presented by J. J. R. Croes† and seconded by John Bogart.

Amendments‡ to the Constitution and By-Laws were presented by J. J. R. Croes and seconded by F. Collingwood.

Amendments§ to the Constitution were presented by George S. Morison and seconded by Charles Macdonald.

* See page 95, (A.)

† See page 105.

An amendment† to the Constitution was presented by Charles Macdonald and seconded by Edward P. North.

Diagrams showing the results of tests upon certain hydraulic cements and upon bricks were then presented by F. Collingwood, and a paper upon the subject was read by him.

OCTOBER 16TH, 1878.—The Society met at 8 P. M., Charles Macdonald in the chair.

A paper by R. Hering, upon the subject of "The Flow of Water, illustrated by Kutter's diagram for ascertaining the flow, with a description of the method of obtaining the mean velocity by inspection," was read by the author; and the diagram, drawn on a large scale with reference to small channels, with a table of co-ordinates, was presented. A blue photo-tracing of the diagram of Kutter, as exhibited at Philadelphia in 1876, was also presented by Mr. Hering.

The subject of the Flow of Water was discussed by Messrs. Worthen, Croes, Hering, and others.

NOVEMBER 6TH, 1878.—THE TWENTY-SIXTH ANNUAL MEETING OF THE SOCIETY.—The Society met at 10 A. M. Vice-President W. Milnor Roberts in the chair. The following members were present:—

Messrs. Andrews, Baxter, L. F. Beckwith, Bogart, Boller, Brush, Collingwood, Cooper, Coryell, Croes, Joseph P. Davis, Dresser, Emery, Endicott, Charles H. Fisher, Bryant Godwin, Charles M. Harris, Kelley, Thomas P. Kinsley, Leavitt, Leverich, Lowthorp, Macdonald, Maurice, Charles L. McAlpine, Melvin, Morison, William H. Paine, Probasco, Raymond, Schuyler, Searles, Shinn, Joseph S. Smith, E. N. K. Talcott, John D. Van Buren, Van Winkle, Walling, Welch, William W. Wilson, Worthen, Yardley.

A letter* from the President, E. S. Chesbrough, was read.

The following tellers were appointed to canvass the ballots at this meeting:—G. W. Dresser, C. M. Harris, D. N. Melvin.

The Annual Report of the Board of Direction* was then presented, read by the Secretary, and on motion was accepted.

The Annual Report of the Treasurer* was presented, read and accepted.

The Report of the Finance Committee* was presented, read and accepted.

The Committee on Gauging of Streams presented a report* through J. J. R. Croes, Chairman, which was read, accepted, and the committee continued.

The Committee on Resistances of Railway Trains presented a report* through William P. Shinn, Chairman, and asked to be discharged. On motion the report was accepted and the committee discharged.

The Committee on Uniform Accounts and Returns of Railway

* To be hereafter published.

† See page 105.

Companies presented a report* through William P. Shinn, Chairman, which was accepted and the committee continued.

The Committee on Permanent Quarters for the Society presented a report* which was read, and on motion accepted and the committee continued.

The Centennial Commission presented a report* which was accepted and the commission was continued.

The Committee on Exhibit of American Engineering at Paris presented a report* through George S. Morison, Chairman, which was read. On motion the report and the memoir accompanying were accepted, and the memoir was referred to the Library Committee for printing in the Transactions of the Society.

On motion, it was also,

Resolved, That a vote of thanks be presented to the Committee on Exhibit of American Engineering at Paris.

The tellers then reported the result of the canvass of votes for officers of the Society, which was announced, and the following named members were declared elected officers of the Society for the ensuing year :—

President : W. MILNOR ROBERTS.

Vice-Presidents : ALBERT FINK, JAMES B. FRANCIS.

Secretary and Librarian : JOHN BOGART.

Treasurer : J. JAMES R. CROES.

Directors : GEORGE S. GREENE.

WILLIAM H. PAINE.

C. VANDERVOORT SMITH.

THEODORE G. ELLIS.

THOMAS C. CLARKE.

The question of time and place for the Eleventh Annual Convention was then taken up. The Secretary presented a summary of the answers to the circular issued on this subject, as follows :

61 Members suggested St. Louis.

44 " " Cleveland.

11 " " San Francisco.

2 " " Baltimore.

2 " " Washington.

And each of the following places was suggested by one member : Buffalo, Chicago, Cincinnati, Montreal, New York, Richmond.

57 Members suggested June.

30 " " May.

5 " " April.

2 " " October.

And each of the following named months was suggested by one member : February, July, September.

The invitation presented at the Tenth Convention, that the Society should hold the next Convention at St. Louis, was repeated.

* To be hereafter published.

An invitation from members of the Society at Cleveland, that the Society should hold its next Convention at that city, was presented, as were also a letter of invitation from the Mayor of Cleveland and one from the Board of Trade of that city, tendering the use of its rooms for the meetings of the Convention.

After discussion, it was

Resolved, That a letter ballot be taken upon the question of the place of the Eleventh Annual Convention.

On motion, it was

Resolved, That no invitations to attend the Convention of the Society be extended to persons not members of the Society, except through the Board of Direction.

The result of the canvass of the ballots for membership was then announced, and the following named candidates were declared elected members :

William L. Baker, of Detroit, Mich. (elected Junior, January 6th, 1875); Frederick B. Howard, of Detroit, Mich. (elected Junior, March 3d, 1875); Wilmon W. C. Sites, of Jersey City, N. J.; Elnathan Sweet, Jr., of Albany, N. Y.

A recess was then (2 P. M.) taken for one hour.

On resuming the session, at 3 P. M., the report * of the Committee on Tests of American Iron and Steel, just received by telegraph from the Chairman, W. Sooy Smith, was presented, read, and accepted.

The Committee on Method of Nominating Officers presented a report * through J. J. R. Croes, Chairman, which was read, and on motion, accepted.

The proposed codification of the Constitution and By-Laws and the amendments offered were then considered.

After discussion, it was, on motion,

Resolved, That the codification of the present Constitution and By-Laws (as printed, page 95, (A.) be approved by this Annual Meeting, and recommended to the Society for adoption.

The proposed Amendments to the Constitution were then considered *seriatim*, and after discussion on each, the following action was taken :

Amendment to Article V. (B, page 105), recommended that it be not adopted.

Amendment to Article V. (C, page 105), recommended that it be not adopted.

Amendment to Article V. (D, page 105), recommended that it be not adopted.

Amendment to Article VI. (E, page 105), recommended that it be not adopted.

Amendment to Article VI. (F, page 106), recommended that it be not adopted.

* To be hereafter published.

Amendment to Article VI. (G, page 106), recommended that it be not adopted.

Amendment to Article VII. (H, page 106), recommended that it be not adopted.

Amendment to Article IX. (I, page 106), recommended that it be not adopted.

Amendment to Article X. (J, page 106), recommended that it be not adopted.

Amendment to Article XVII. (K, page 106), recommended that it be adopted.

Amendment to Article XVIII. (L, page 107), recommended that it be adopted.

Amendment to Article XIX. (M, page 107), recommended that it be not adopted.

Amendment to Article XXIII. (N, page 108), recommended that it be adopted.

Amendment to Article XXXII. (O, page 108), recommended that it be adopted.

Amendment—a new Article (P, page 108), recommended that it be adopted.

The proposed amendments to the By-Laws were then considered, and after discussion on each, the following action was taken :

Amendment to Section 1 (R, page 108), recommended that it be adopted.

Amendment to Section 23 (S, page 109), recommended that it be adopted.

Amendment to Section 24, second clause (T, page 109), recommended that it be not adopted.

An amendment to Section 24 of the By-Laws, which was embodied in the report of the Committee on the Method of Nominating Officers, was, on motion, referred back to the committee, and the committee continued.

The Annual Meeting adjourned at 6:45 p. m.

OF THE BOARD OF DIRECTION.

AUGUST 7TH, 1878.—Applications for membership were considered. Appropriations were made and other financial business transacted.

SEPTEMBER 4TH, 1878.—Applications for membership were considered. The preparation of the Annual Report was directed.

OCTOBER 2D, 1878.—Applications for membership were considered. Matters referred to the Board by the Society were discussed, and the preparation of a codification of the present provisions of the Constitution and By-Laws was directed. The report of the Committee on Nomi-

nations was received, and it was ordered that a letter ballot should be prepared and issued in accordance with the By-Laws. A report as to arrears of dues was presented by the Secretary, and special letters were directed to be sent to members in arrears.

OCTOBER 31ST, 1878.—Applications for membership were considered. appropriations made and financial business transacted. The Annual Report was considered in detail. The recovery of the railroad stock belonging to the Society, but not in its possession for the past ten years, was reported by the Secretary.

NOVEMBER 5TH, 1878.—The Annual Report was perfected. Financial business was transacted.

CONSTITUTION AND BY-LAWS OF THE SOCIETY.

[A.] PROPOSED CODIFICATION OF THE PRESENT CONSTITUTION AND BY-LAWS.

(This codification does not change the present provisions of the Law of the Society, but is a re-arrangement and condensation of the original provisions and adopted amendments.)

NOTE. This codification was prepared by the Board of Direction, and with a report was presented and seconded at the meeting of the Society, October 2d, 1878.*

At the Annual Meeting, November 6th, 1878,† this codification was approved and recommended to the Society for adoption. It, with the amendments printed below, will be submitted to letter ballot.

CONSTITUTION.

Article I.—This Association shall be called the “AMERICAN SOCIETY OF CIVIL ENGINEERS.”

Article II.—Its objects shall be : The professional improvement of its members, the encouragement of social intercourse among men of practical science, the advancement of engineering in its several branches, and the establishment of a central point of reference and union for its members.

Article III.—Among the means to be employed for attaining these ends, shall be periodical meetings for the reading of professional papers and the discussion of scientific subjects ; the foundation of a library, the collection of maps, drawings and models, and the publication of such parts of the proceedings as may be deemed expedient.

Article IV.—Civil, Military, Geological, Mining and Mechanical Engineers, Architects, and other persons who by profession are interested in the advancement of science, shall be eligible for admission in their appropriate class.

* See page 90. † See page 93.

Article V.—The officers of the Society shall consist of a President, two Vice-Presidents, a Secretary, Treasurer, Librarian, and five Directors, who shall be elected by written ballot, by a majority of votes, at the Annual Meeting of the Society, and shall hold their offices until others are elected. Any vacancy occasioned by resignation or otherwise, may be filled at the next monthly meeting after notice of said vacancy.

Article VI.—The President, Vice-Presidents, Secretary, Treasurer and Directors shall constitute a Board of Direction, and shall be the Trustees of this Society, under the Act of the Legislature of April 12th, 1848, chapter 319, Laws of the State of New York.

Article VII.—The Board of Direction shall meet within one week after their election, and the first business in order shall be the appointment of a Standing Committee of three on Finance, and of a Standing Committee of three on Library.

Article VIII.—The President, and in his absence the Vice-Presidents in rotation, shall preside at all the meetings of the Society; and in case of their absence, a President pro tempore shall be appointed.

Article IX.—The Secretary shall keep an accurate record of all the transactions of the Society and of the Board of Direction, and shall issue all notices.

Article X.—The Treasurer shall have charge of the funds of the Society, receive all assessments and pay all bills and orders approved by the President or the Chairman of the Finance or Library Committees. The duties of the Secretary and Treasurer may be united in the same person, if the Society think proper. Moneys belonging to the Society, paid to any of its officers, shall, with a statement showing for what the payment was made, be promptly transmitted to the Treasurer, who shall receipt therefor.

The Treasurer shall deposit the moneys and invest the funds of the Society, in its name, by and with the advice of the Board of Direction; he shall sign all checks.

No indebtedness shall be incurred for the Society, except under such rules as prescribed by the Board of Direction.

No bill shall be paid for the Society until it has been certified by the person authorized to contract it, and audited by the Committee on Finance.

Article XI.—It shall be the duty of the Librarian to take charge of the library of the Society, and to see that all books are marked with the name of the Society, numbered, and recorded in a catalogue. In respect to the management of the library, he shall conform to such regulations as may be prescribed by the Society or by the Board of Direction.

Article XII.—The duties of the Board of Direction shall be: to have a general care of the affairs of the Society; to apply the funds in the treasury; to recommend the amount of assessments and appropriations for specific purposes, and to make a report on the affairs of the Society, embracing the report of the Treasurer, at the Annual Meeting.

Article XIII.—The Finance Committee shall have supervision of the accounts of the Society, shall examine all bills and demands, audit the accounts of the Treasurer, and certify to his annual report.

Article XIV.—The Library Committee shall have supervision of the rooms, printing and library of the Society, and shall apply to the purchase of books or other articles of permanent value to the Society, such sums as may be appropriated.

Article XV.—At any regular meeting of the Society, seven members shall constitute a quorum for the transaction of business. But the action of a less number at any monthly meeting, at which a quorum is not present, may be entered on the journal, provided such action does not affect the rights of the association, or any members thereof.

Article XVI.—The active members of the Society shall be divided into three classes, to be styled, respectively, Members, Associates and Juniors; and each person, when duly elected and qualified, shall receive a certificate of membership, indicative of the peculiar class which he represents. Associates and Juniors shall possess all the rights and privileges of Members, excepting the right of voting.

Article XVII.—To be eligible as a Member, the candidate must have been in the actual practice of his profession for at least seven years, and have been in charge of work or of operations in his particular branch of engineering or of science. A diploma from any collegiate institution in good standing, conferring the degree of C. E., shall be considered equivalent to two years' service. The candidate for Member must be a Civil, Military, Mining or Mechanical Engineer, who has been in active practice as such for seven years, or has graduated as Civil Engineer and been in practice for five years, and has had responsible charge of work as Chief, Resident or Superintending Engineer for at least one year; not as a skillful workman merely, but as one qualified to design as well as to direct public work.

To be eligible as an Associate, the candidate must be one whose connection with science or the arts qualifies him to concur with civil engineers in the advancement of professional knowledge. An Associate shall be a manager of a railroad, canal or other public work; a geologist, chemist or mathematician; a proprietor of a mine or metallurgical works; an architect or a manufacturer; or one who, from his scientific acquirements or practical experience, has attained eminence in his special pursuit, qualifying him to co-operate with engineers in the advancement of professional knowledge; but shall not himself be practicing as an engineer.

To be eligible as a Junior, the candidate must have been in the actual practice of his profession for at least two years, and shall be one who has had actual practice in some of the branches of civil, military, mining or mechanical engineering, for not less than two years; or if a graduate of a scientific or collegiate institution—for not less than one year.

Article XVIII.—All candidates for admission to the Society must file

statements by themselves, setting forth the grounds of their claim to be elected; be proposed by at least five members of the Society, to whom they must be personally known, and a notification of the same sent to each member whose place of address is on record. Each proposition, with the names of the proposers, must be posted in some conspicuous place in the rooms of the Society, for at least twenty-five days before being submitted to vote. All such papers and applications shall be laid before the Board of Direction, and be reported upon previous to action by the Society. Nominations and proposals for admission to the Society shall be endorsed by at least five members, who certify that they personally know the nominee or candidate, and that he is worthy of acceptance. The proposal of Member, Associate, or Junior shall contain a statement over the candidate's signature, of his age, residence, the nature and term of his professional service, and that he will conform to the requirements of membership, if elected. Honorary Members, Corresponding Members, and Fellows shall not be required to present themselves as candidates; those making the nominations shall state the grounds therefor, and certify that the nominee would accept if elected.

A proposal for transfer from one class to a higher shall be made by at least five Members, who state the age of the candidate, and the nature and term of his professional service since his admission to the Society. Such statement shall show a degree of qualification sufficient to render the proposed eligible to election in the class to which the transfer is asked. Upon approval of the Board of Direction, the candidate shall be balloted for, as provided for the election of members; and when the transfer is made, he shall not be required to pay an additional entrance fee.

Article XIX.—In elections for membership of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after twenty-five days have elapsed from the time of mailing the notification. Five or more ballots cast in the negative shall exclude. Members notified, but not responding, shall be classed as having voted in the affirmative. In case of the non-election of any person balloted for, no notice shall be taken thereof in the minutes.

Article XX.—On being thus elected, the candidate must subscribe to the Constitution and By-Laws (in the terms set forth in Form A in the Appendix), and pay to the Treasurer of the Society such sum as may be determined upon, under the authority of Article XXII. of the Constitution, as the regular entrance fee and yearly assessment, before he can be entitled to receive his certificate of membership. If this be not done within six months from notification of the election, said election shall be considered void.

Article XXI.—Persons thus elected and duly qualified, who reside within fifty miles of the Post Office in the City of New York, shall be

deemed resident ; and those who reside beyond this limit shall be deemed non-resident. The membership of any person shall begin on the day of his election.

Article XXII.—The amount of entrance fee to be paid, as well as the annual dues or assessments for the support of the Society, shall be determined from time to time, at some regular meeting of the Society, provided that notice of intended action thereon shall have been given at a previous regular meeting. No alteration in the amount of said fees or assessments shall apply to the fiscal year during which it is made, but shall take effect on and after the first Wednesday in November next succeeding the day of the date of said alteration. Members who become residents or non-residents by removal into or beyond the limits prescribed in Article XXI. shall be subject to assessments in the class in which they were on the day of the Annual Meeting, as may appear upon the records of the Society or by written notice to the Secretary.

Article XXIII.—Honorary members, not exceeding forty in number, having been nominated as required in Article XVIII., may be elected by a unanimous vote. An Honorary Member shall be one of acknowledged eminence in some branch of engineering, who has had not less than thirty years' practice.

Persons residing out of the United States may be elected Corresponding Members, in the same manner as hereinbefore provided for the choice of immediate members. A Corresponding Member shall be one, not a resident of the United States, eminent in a special branch of engineering, or able to supply valuable information relating thereto, who will communicate with the Society at least once a year. Corresponding and Honorary Members shall be subject to no fees or assessments. They may attend any meetings of the Society, but shall not be entitled to vote.

Article XXIV.—There shall be a fund, called the "Fellowship Fund," devoted exclusively to the publication of the papers read before the Society. Any persons, whether members or otherwise, if acceptable to the Society, may subscribe thereto. The subscribers to this fund shall be called "Fellows of the Society." A Fellow shall be an acceptable subscriber, who has signified to his proposers a desire to be nominated, and an intention, if elected, to become a member of this class.

Persons who are not members, and who become Fellows, shall be entitled to all the privileges of the Society, except the right to vote. Members who become Fellows, shall, in addition to all the rights they possess as members, be entitled to receive duplicate copies of all the publications of the Society.

Article XXV.—Whenever any person is elected, the Secretary shall immediately inform him of the same by letter (Form B in the Appendix), and the election of Honorary Members shall be likewise communicated to them by a letter suited to each particular case ; but no person shall be

considered a Corresponding or Honorary Member unless he signify within six months his acceptance of membership.

Article XXVI.—Every person admitted to the Society shall be considered as belonging thereto and liable to the payment of all assessments, until he shall have signified to the Secretary his desire to withdraw; when, if his dues have been fully paid up, his name shall be erased from the list of members. Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

Article XXVII.—Any person admitted to the Society, who shall refuse to pay any assessment or other dues to the Society, or who shall neglect the same for the term of six months after due notice is issued (in the Form C in the Appendix), shall cease to be a member.

Article XXVIII.—Upon the written request of ten or more Members that, for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defense. Two months after such advice is given, the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defense made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member, and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall, in any event, be the only public announcement of the matter.

Article XXIX.—The permanent place for the transaction of the business of this Society shall be in the City of New York.

Article XXX.—The Annual Meeting for the election of officers and the hearing of the annual reports shall be held on the first Wednesday in November.

Article XXXI.—The annual contributions shall become due at the time of the Annual Meeting, and shall be payable in advance; and it shall be the duty of the Secretary to notify the amount of assessment or subscription due at the time of giving notice of such meeting.

Article XXXII.—Proposed amendments to this Constitution shall be first submitted to the Society and seconded, and then sent by letter to the several Members of the Society at least twenty-eight days previous to the Annual Meeting. Such amendments shall be in order for discussion at such Annual Meeting, and shall be voted upon by letter ballot, within sixty days after the date of said meeting. The vote shall be counted by the President and Secretary, and if two-thirds of the votes are in favor of said amendment, it shall be declared adopted, and the result announced at the next regular meeting of the Society thereafter.

BY-LAWS.

Section 1.—The regular meetings of the Society shall be held on the first Wednesday in each month. There shall be meetings of the Society held on the third Wednesday in each month for professional improvement, and the encouragement of social intercourse among men of practical science, at which papers shall be read and subjects discussed relating to the theory and practice of engineering, and no other business transacted. The Board of Direction may suspend meetings of the Society in the months of July and August.

A convention of the Society, for professional discussion and social intercourse, shall be held annually at such place as the Society may determine, and be presided over by a Chairman selected from among members not officers of the Society. During the Convention a regular meeting of the Society, to be presided over by the officers of the Society, may be held for the transaction of business.

The officers of the Society may give a reception at the Society's rooms, on the evenings of the second and fourth Wednesdays of each month between October and April, for the purpose of informal professional conversation and social intercourse. Regulations concerning refreshments and the invitation of guests may be made by a committee appointed for the purpose, but shall be without expense to the Society.

Sec. 2.—At the regular meetings of the Society, the following order shall be observed in the transaction of business, unless set aside for the time being by a vote of the members present:

1st. The record of last meeting to be read, approved and signed by the Chairman and Secretary.

2d. Candidates for membership to be balloted for.

3d. Communications received since the last regular meeting to be announced, and read if required.

4th. Communications from members present to be read.

5th. Communications from the Board of Direction to be brought forward.

6th. Reports of committees to be called for.

7th. Unfinished business to be taken up.

8th. New business to be proposed.

9th. Questions for debate to be discussed.

The same order shall be observed, as far as practicable, at the meetings of the Board of Direction.

Sec. 3.—All decisions of the Chair, on points of order, shall be conclusive, unless reversed on appeal to the meeting.

Sec. 4.—Every motion shall be first stated by the President, before debate or taking the question, and every motion shall be reduced to writing, if the President or any member desire it.

Sec. 5.—When a question is under debate, no motion shall be in order,

unless for the previous question ; to postpone indefinitely ; to postpone to a day certain ; to lay on the table ; to commit, to amend, or to adopt.

Sec. 6.—A motion to adjourn should always be in order, and shall be decided without debate.

Sec. 7.—If required by one-fifth of the whole number of members present, the ayes and nays upon any question shall be called, and entered upon the journal.

Sec. 8.—No motion for reconsideration shall be in order, unless one of the majority shall move such reconsideration. A motion for reconsideration, being put and lost, shall not be renewed, nor shall any subject or vote be a second time reconsidered without unanimous consent.

Sec. 9.—The Board of Direction may call meetings of the Society when they deem it expedient, and shall be bound to do so at the written request of seven members, stating the purpose of such meeting. Ten days notice shall be given to members of any special meeting ; the purpose thereof shall be stated in the notice, and no other business shall be taken up at that meeting.

Sec. 10.—The rooms of the Society shall be open from 9 A. M. to 4 P. M., every business day, unless otherwise determined by the Board of Direction.

Sec. 11.—Every member shall have the privilege of introducing visitors to the room while the Society is not in session, by writing their names and his own, in a book provided for that purpose.

Sec. 12.—A record of all donations to the Society, whether in money, books, maps, models or other articles of value, with the name of the donors, shall be entered by the Secretary in a book provided for that purpose, to be kept at the rooms of the Society.

Sec. 13.—The books, maps, and other property of the Society, shall only be removed from the rooms under such rules and regulations as shall be prescribed by the Committee on Library, and approved by the Board of Direction.

Sec. 14.—A book shall be kept by the Librarian, in which members may enter the title of any book, map or plan, which they may wish to have added to the library.

Sec. 15.—The records of the Society shall at all times be open to members, and such books of accounts shall be kept in its rooms as the Board of Direction may designate.

Sec. 16.—When a paper is presented to the Society, the Secretary shall at once examine it, and report thereon to the Committee on Library, with reference to this standard ; papers containing old matter, readily found elsewhere, those specially meant to advocate personal interests, those carelessly prepared or controverting established facts, and those purely speculative or foreign to the purposes of the Society, should be rejected. The committee shall then determine whether such paper may go before the Society. They can return it to the writer for correction

and emendation, and call to their aid one or more members of special experience relating to the subject treated, either to advise on the paper or to discuss it. Such papers as in the judgment of the committee should go before the Society shall promptly, upon their acceptance, be printed; others shall be recorded in books provided for the purpose. When, however, the Library Committee does not feel authorized to publish a paper, they may provide an abstract thereof, which, when approved by the author, may be published instead of the original paper.

Sec. 17.—The annual report of the Treasurer shall be certified to by at least two members of the Committee on Finance.

Sec. 18.—The Board of Direction shall determine the order of its stated and special meetings; provide for an executive committee to act in the absence of a quorum, or during the intervals between the meetings; prescribe regulations for balloting, and generally conduct the business affairs of the Society. The record of the proceedings of the Board of Direction made since the last regular meeting of the Society shall be read at each regular meeting.

Sec. 19.—A nomination or proposal shall be presented at the next regular meeting of the Board of Direction following its receipt; when it is thereby approved, and the applicant (if for admission as Member, Associate or Junior) classed with his consent, a day shall be fixed for the ballot to be canvassed, which shall be at a regular meeting of the Society, not less than twenty-five days thereafter.

Sec. 20.—When such day is fixed, the Secretary shall conspicuously post in the room of the Society the name and class of the nominee or applicant, his residence, occupation, and the names of his proposers; he shall mail to each member whose address is known a notice of the same, with a letter ballot in such form as shall be prescribed by the Board of Direction, and request the recipient to vote thereby or in person in the usual manner on the day fixed, when an open canvass of the votes cast shall be made, and the result announced.

Sec. 21.—The proposers of any rejected candidate may, within three months after such rejection, lay before the Board of Direction written evidence that an error was then made, and ask for a reconsideration of the proposal, which shall be granted on sufficient grounds, and if a ballot has been taken, another shall be ordered.

Sec. 22.—Persons who shall be elected members of this Society after six months of any fiscal year shall have expired, shall pay only one-half of the amount of dues for that fiscal year, otherwise required.

Sec. 23.—Special committees to report upon engineering subjects shall be authorized only by a majority of the votes cast by the Society, and in the following manner: Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument for and against the appointment of such committee, which statement shall be printed

and issued to the Society with letter ballot ; or, if the Board fails to report within one month, the letter ballot shall be issued without comment ; or, the Society may vote by ballot at the Annual Meeting or in Annual Convention upon such resolution, within one month after it has been submitted to the Board of Direction.

Sec. 24.—1st. Votes for officers of the Society at the annual meeting in November may be sent by mail, inclosed in two sealed envelopes, the outer one of which shall be indorsed with the voter's signature, and all such votes shall be counted on the first ballot for officers.

2d. If it should appear that for any office a majority of the votes cast were not for one person, the meeting shall proceed to vote by ballot in the usual way for such officer, the choice of candidates being limited to the two persons not elected for whom the greatest number of votes had been previously cast for such office. In case three or more names have received an equal number of votes, the choice shall be made from among those names.

3d. At the Annual Convention a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention. This committee shall present to the Board of Direction, on or before the first day of October ensuing, the names of the persons selected by them as candidates for officers. Of these at least one Vice-President, three Directors, the Secretary and the Treasurer shall be resident members.

4th. The Board of Direction shall thereupon cause such list to be posted in the rooms of the Society, and shall issue, at least twenty days before the Annual Meeting, a letter ballot containing the names thus proposed.

5th. Any five members, not officers of the Society, may present to the Board of Direction, on or before October 1st, a list of names proposed by them for officers, which list or lists shall also be issued for ballot.

6th. No member of any Nominating Committee shall be presented by such committee as a candidate for office.

*Sec. 25.—*The President of the Society shall have the general supervision of the business and correspondence of the Society ; he shall be an Honorary Member of all committees, but shall have no vote on such committees. In all cases where the By-Laws or resolutions of the Society or of the Board of Direction require specific duties to be performed by the President, the senior resident Vice-President present shall perform such duties in absence of the President, on receiving notice from the President to perform such duties.

*Sec. 26.—*Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast shall be necessary for the adoption of any such addition or amendment.

AMENDMENTS PROPOSED TO THE CONSTITUTION.

[The following amendments have been regularly offered and seconded—They were discussed at the annual meeting, November 6th, 1878, and action upon them taken as stated. They will be submitted to letter ballot.]

[B.] Amendments proposed to Article V.

At the Annual Meeting it was recommended that this be not adopted.

Article V.—The officers of the Society shall consist of a President, three Vice-Presidents, five Directors, a Secretary, a Treasurer and a Librarian, all of whom, except the Librarian, shall be members of at least five years standing.

The President, Vice-Presidents, and Directors shall constitute a Board of Direction, and shall be the Trustees of the Society under the provisions of chapter 319 of the Laws of the State of New York, passed April 12th, 1848.

[C.] Amendment proposed to Article V.

At the Annual Meeting it was recommended that this be not adopted.

Article V.—The officers of the Society shall be a President, three Vice-Presidents, five Directors, a Secretary, a Treasurer, and a Librarian. The President, Vice-Presidents and Directors shall be members of at least five years standing, and shall constitute a Board of Direction and be the Trustees of the Society, under the provisions of chapter 319 of the Laws of the State of New York, passed April 12th, 1848.

[D.] Amendment proposed to Article V.

At the Annual Meeting it was recommended that this be not adopted.

To amend Article V, so far as relates to the election of a Secretary, as follows :

Hereafter the Secretary shall be appointed by the Board of Direction, and hold his office during its pleasure. This amendment shall take effect on its passage and its provisions shall apply to the Secretary elected in November next.

[E.] Amendment proposed to Article VI.

At the Annual Meeting it was recommended that this be not adopted.

Article VI.—The members of the Board of Direction shall be elected by the Society by written ballot at the Annual Meeting of the Society, and shall hold their offices until others are elected.

Their term of office shall begin on the first of January succeeding the Annual Meeting, and shall continue one year, or until their successors are elected.

Any vacancies occurring during the year shall be filled by the Board of Direction.

The Secretary and Librarian and Treasurer shall be appointed by the vote of not less than six members of the Board of Direction and shall

* See page 93.

hold office until removed by resignation or by a vote of not less than six members of the Board,

The duties of the Secretary and Librarian may be united in the same person if the Board so direct.

[F.] Amendment proposed to Article VI.

At the Annual Meeting it was recommended that this be not adopted.

Strike out the words, "The duties of Secretary and Librarian may be united in the same person if the Board so direct," and substitute for them the words, "The office of Librarian may be filled by an Associate or Junior, or its duties may be united in the same person with those of the Secretary."

[G.] Amendment proposed to Article VI.

At the Annual Meeting it was recommended that this be not adopted.

Strike out the same words as above, and substitute for them the words, "The offices of Secretary and Librarian may be filled by an Associate or Junior, and the duties may be performed by one and the same person."

[H.] Amendment proposed to Article VII.

At the Annual Meeting it was recommended that this be not adopted.

Article VII.—During the interval between the Annual Meeting and the first of January next ensuing, the President-elect shall appoint a Standing Committee of three on Finance, and of three on Library, from members of the Board for the ensuing year.

[I.] Amendment proposed to Article IX.

At the Annual Meeting it was recommended that this be not adopted.

Article IX.—The Secretary shall superintend the house of the Society, conduct the correspondence, edit the publications, issue all orders for supplies, and keep the books of account and records, all under the instructions of the Board of Direction and the Standing Committees. He shall receive such compensation for his services and such allowance for clerical aid as the Board of Direction may from time to time determine.

[J.] Amendment proposed to Article X.

At the Annual Meeting it was recommended that this be not adopted.

Article X.—The Treasurer shall have charge of the funds of the Society, receive all moneys and pay all bills which have been certified by the Secretary and approved by the Finance Committee. He shall give bonds in the sum of five thousand dollars, for the faithful performance of his duties, which bonds shall be approved by the Board of Direction. He shall deposit the moneys and invest the funds of the Society in its name and by and with the advice of the Board of Direction. All disbursements shall be made by checks signed by him.

[K.] Amendment proposed to Article XVII.

At the Annual Meeting it was recommended that this be adopted.

Article XVII.—A Member shall be a Civil, Military, Mining or Mechanical Engineer, who has been in active practice as such for seven years, or has graduated as Civil Engineer and been in practice for five years, and has had responsible charge of work as Chief, Resident or

Superintending Engineer for at least one year ; not as a skillful workman merely but as one qualified to design as well as to direct public work.

An Associate shall be a manager of a railroad, canal or other public work ; a geologist, chemist or mathematician ; a proprietor or manager of a mine or metallurgical works ; an architect or a manufacturer, or one who, from his scientific acquirements or practical experience, has attained eminence in his special pursuit, qualifying him to co-operate with engineers in the advancement of professional knowledge ; but shall not himself be practicing as an engineer.

A Junior shall be one who has had actual practice in some of the branches of civil, military, mining or mechanical engineering, for not less than two years ; or if a graduate of a scientific or collegiate institution—for not less than one year.

A person to be eligible to any class of membership must not be less than twenty-one years of age.

[L.] Amendment proposed to Article XVIII.

At the Annual Meeting it was recommended that this be adopted :

Article XVIII.—Nominations and proposals for admission to the Society shall be indorsed by at least five Members, who certify that they personally know the nominee or candidate, and that he is worthy of acceptance. The proposal of Member, Associate or Junior shall contain a statement, over the candidate's signature, of his age, residence, the nature and term of his professional service, and that he will conform to the requirements of membership, if elected. Fellows shall not be required to present themselves as candidates ; those making the nomination shall state the ground therefor, and certify that the nominee will accept if elected.

A proposal for transfer from one class to a higher shall be made by at least five Members, and shall state the age of the candidate, and the nature and term of his professional service since his admission to the Society. Such statement shall show a degree of qualification sufficient to render the proposed eligible to election in the class to which transfer is asked. Upon the approval of the Board of Direction, the candidate shall be balloted for, as provided in the election of members ; and when the transfer is made, he shall be required to pay as an additional entrance fee the amount of the difference between the entrance fees of the two classes.

[M.] Amendment proposed to Article XIX.

At the Annual Meeting it was recommended that this be not adopted :

Article XIX.—Elections for active members shall be by letter ballot, and the result shall be announced at the next regular meeting held after twenty-five days have elapsed from the time of mailing the notification. Five or more ballots cast in the negative shall exclude.

In case of the non-election of any person balloted for, no publication thereof shall be made.

[N.] Amendment proposed to Article XXIII.

At the Annual Meeting it was recommended that this be adopted :

Article XXIII.—Honorary Members, not exceeding twenty in number in all, may be appointed by a unanimous vote of the Board of Direction and the Past Presidents of the Society. A person to be eligible as an Honorary Member shall be a gentleman of acknowledged eminence in some branch of engineering. Honorary Members shall be subject to no fees or assessments and shall not be entitled to vote.

[O.] Amendment proposed to Article XXXII.

At the Annual Meeting it was recommended that this be adopted :

Article XXXII.—Proposed amendments to this Constitution must be submitted in writing, signed by not less than five Members on or before the first Wednesday in October, and then sent by letter to the several Members of the Society, at least twenty-five days previous to the Annual Meeting. Such amendments shall be in order for discussion at such Annual Meeting and shall be voted upon by letter ballot, the vote to be counted at the first regular meeting in February. An affirmative vote of two-thirds of all ballots cast shall be necessary to secure the adoption of any amendment.

[P.] Amendment proposed ; a new article.

At the Annual Meeting it was recommended that this be adopted :

Article—(A new Article).—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, and who from ill-health, advanced age, or other good reason assigned, is unable to pay such dues ; and the Board may remit the whole or part of assessments in arrears, or accept in lieu thereof, desirable additions to the Library and Museum.

AMENDMENTS PROPOSED TO THE BY-LAWS.

[R.] Amendment to Section 1.

At the Annual Meeting it was recommended that this be adopted :

SECTION 1.—The regular meetings of the Society shall be held on the first Wednesday in each month. There shall be meetings of the Society held on the third Wednesday in each month, for professional improvement, and the encouragement of social intercourse among men of practical science, at which papers shall be read and subjects discussed relating to the theory and practice of engineering, and no other business transacted. The Board of Direction may suspend meetings of the Society in the months of July and August.

A Convention of the Society for professional discussion and social intercourse shall be held annually at such place as the Society may determine, and be presided over by a Chairman selected from among members not officers of the Society. During the Convention, a regular meeting of the Society, to be presided over by the officers of the Society, may be held for the transaction of business.

On the evening of the first day of the Convention, there shall be held .

a meeting to which the public may be invited, and at which the President of the Society shall deliver an address giving a summary of engineering progress during the preceeding year.

[S.] Amendment to Section 23.

At the Annual Meeting it was recommended that this be adopted :

SECTION 23.—Special committees to report upon engineering subjects shall be authorized only by a majority of the votes cast by the Society, and in the following manner : Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument for and against the appointment of such committee, which statement shall be printed and issued to the Society with letter ballot ; or, if the Board fails to report within one month, the letter ballot shall be issued without comment.

[T.] Amendment to section 24, second clause.

At the Annual Meeting it was recommended that this be not adopted :

2d. The person having the greatest number of votes for the respective offices shall be declared elected. In case of a tie the decision shall be by ballot of the members present.

RESOLUTION SUBMITTED TO LETTER BALLOT.

The following resolution was presented at the meeting of the Society, held August 7th, 1878, and in accordance with the By-Laws was referred to the Board of Direction.

It was then submitted to letter ballot with the arguments for and against, as printed below, and the ballot being canvassed October 2d, 1878, the resolution was lost.

Resolved, That a committee of five be appointed by the President to investigate and report upon the conditions calculated for maximum economy in the use of steam in steam engines.

ARGUMENT FOR.

The causes which prevent the full utilization in an engine, of the steam generated by the fuel are various. The proportional effect of each of such causes and the best means of reducing such effect, are questions on which great diversity of opinion exists. These questions can best be solved by an analysis of the record of work done by existing machines when working under various conditions. Such an analysis can best be made by a committee of experts working under the auspices of the Society. A committee of this kind can obtain facts which could not be procured by individuals working separately, and can discuss and analyze the data collected in a manner not possible by independent observers. The aim of the resolution is the collection, in useful form, of information of value to all who are interested in steam engine economy, and is therefore in furtherance of the objects of the Society.

ARGUMENT AGAINST.

The determination of the relative effect produced by each of a multiplicity of causes working together cannot be reasoned out on general principles, but can only be made by several series of analytical experiments, in each of which care is taken to have one element variable while the others remain constant.

A committee of the kind proposed could not undertake such experiments, which would necessarily be expensive.

Published reports of the performance of different types of engines are so notoriously inexact and incomplete as to preclude the possibility of the deductions drawn from them being useful for a close analysis. The committee would be obliged, however, to base their conclusions on incomplete data, or else supplement them by theoretical reasoning. The report of a committee of this Society should be based on incontrovertible facts, and not be open to the criticism that where facts failed unsupported theory was called in to their aid.

For these reasons the appointment of the committee at this time seems inadvisable.

considered a Corresponding or Honorary Member unless he signify within six months his acceptance of membership.

Article XXVI.—Every person admitted to the Society shall be considered as belonging thereto and liable to the payment of all assessments, until he shall have signified to the Secretary his desire to withdraw; when, if his dues have been fully paid up, his name shall be erased from the list of members. Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

Article XXVII.—Any person admitted to the Society, who shall refuse to pay any assessment or other dues to the Society, or who shall neglect the same for the term of six months after due notice is issued (in the Form C in the Appendix), shall cease to be a member.

Article XXVIII.—Upon the written request of ten or more Members that, for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defense. Two months after such advice was given, the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defense made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member, and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall, in any event, be the only public announcement of the matter.

Article XXIX.—The permanent place for the transaction of the business of this Society shall be in the City of New York.

Article XXX.—The Annual Meeting for the election of officers and the hearing of the annual reports shall be held on the first Wednesday in November.

Article XXXI.—The annual contributions shall become due at the time of the Annual Meeting, and shall be payable in advance; and it shall be the duty of the Secretary to notify the amount of assessment or subscription due at the time of giving notice of such meeting.

Article XXXII.—Proposed amendments to this Constitution shall be first submitted to the Society and seconded, and then sent by letter to the several Members of the Society at least twenty-eight days previous to the Annual Meeting. Such amendments shall be in order for discussion at such Annual Meeting, and shall be voted upon by letter ballot, within sixty days after the date of said meeting. The vote shall be counted by the President and Secretary, and if two-thirds of the votes are in favor of said amendment, it shall be declared adopted, and the result announced at the next regular meeting of the Society thereafter.

BY-LAWS.

Section 1.—The regular meetings of the Society shall be held on the first Wednesday in each month. There shall be meetings of the Society held on the third Wednesday in each month for professional improvement, and the encouragement of social intercourse among men of practical science, at which papers shall be read and subjects discussed relating to the theory and practice of engineering, and no other business transacted. The Board of Direction may suspend meetings of the Society in the months of July and August.

A convention of the Society, for professional discussion and social intercourse, shall be held annually at such place as the Society may determine, and be presided over by a Chairman selected from among members not officers of the Society. During the Convention a regular meeting of the Society, to be presided over by the officers of the Society, may be held for the transaction of business.

The officers of the Society may give a reception at the Society's rooms, on the evenings of the second and fourth Wednesdays of each month between October and April, for the purpose of informal professional conversation and social intercourse. Regulations concerning refreshments and the invitation of guests may be made by a committee appointed for the purpose, but shall be without expense to the Society.

Sec. 2.—At the regular meetings of the Society, the following order shall be observed in the transaction of business, unless set aside for the time being by a vote of the members present:

1st. The record of last meeting to be read, approved and signed by the Chairman and Secretary.

2d. Candidates for membership to be balloted for.

3d. Communications received since the last regular meeting to be announced, and read if required.

4th. Communications from members present to be read.

5th. Communications from the Board of Direction to be brought forward.

6th. Reports of committees to be called for.

7th. Unfinished business to be taken up.

8th. New business to be proposed.

9th. Questions for debate to be discussed.

The same order shall be observed, as far as practicable, at the meetings of the Board of Direction.

Sec. 3.—All decisions of the Chair, on points of order, shall be conclusive, unless reversed on appeal to the meeting.

Sec. 4.—Every motion shall be first stated by the President, before debate or taking the question, and every motion shall be reduced to writing, if the President or any member desire it.

Sec. 5.—When a question is under debate, no motion shall be in order,

unless for the previous question ; to postpone indefinitely ; to postpone to a day certain ; to lay on the table ; to commit, to amend, or to adopt.

Sec. 6.—A motion to adjourn should always be in order, and shall be decided without debate.

Sec. 7.—If required by one-fifth of the whole number of members present, the ayes and nays upon any question shall be called, and entered upon the journal.

Sec. 8.—No motion for reconsideration shall be in order, unless one of the majority shall move such reconsideration. A motion for reconsideration, being put and lost, shall not be renewed, nor shall any subject or vote be a second time reconsidered without unanimous consent.

Sec. 9.—The Board of Direction may call meetings of the Society when they deem it expedient, and shall be bound to do so at the written request of seven members, stating the purpose of such meeting. Ten days notice shall be given to members of any special meeting ; the purpose thereof shall be stated in the notice, and no other business shall be taken up at that meeting.

Sec. 10.—The rooms of the Society shall be open from 9 A. M. to 4 P. M., every business day, unless otherwise determined by the Board of Direction.

Sec. 11.—Every member shall have the privilege of introducing visitors to the room while the Society is not in session, by writing their names and his own, in a book provided for that purpose.

Sec. 12.—A record of all donations to the Society, whether in money, books, maps, models or other articles of value, with the name of the donors, shall be entered by the Secretary in a book provided for that purpose, to be kept at the rooms of the Society.

Sec. 13.—The books, maps, and other property of the Society, shall only be removed from the rooms under such rules and regulations as shall be prescribed by the Committee on Library, and approved by the Board of Direction.

Sec. 14.—A book shall be kept by the Librarian, in which members may enter the title of any book, map or plan, which they may wish to have added to the library.

Sec. 15.—The records of the Society shall at all times be open to members, and such books of accounts shall be kept in its rooms as the Board of Direction may designate.

Sec. 16.—When a paper is presented to the Society, the Secretary shall at once examine it, and report thereon to the Committee on Library, with reference to this standard ; papers containing old matter, readily found elsewhere, those specially meant to advocate personal interests, those carelessly prepared or controverting established facts, and those purely speculative or foreign to the purposes of the Society, should be rejected. The committee shall then determine whether such paper may go before the Society. They can return it to the writer for correction

and emendation, and call to their aid one or more members of special experience relating to the subject treated, either to advise on the paper or to discuss it. Such papers as in the judgment of the committee should go before the Society shall promptly, upon their acceptance, be printed; others shall be recorded in books provided for the purpose. When, however, the Library Committee does not feel authorized to publish a paper, they may provide an abstract thereof, which, when approved by the author, may be published instead of the original paper.

Sec. 17.—The annual report of the Treasurer shall be certified to by at least two members of the Committee on Finance.

Sec. 18.—The Board of Direction shall determine the order of its stated and special meetings; provide for an executive committee to act in the absence of a quorum, or during the intervals between the meetings; prescribe regulations for balloting, and generally conduct the business affairs of the Society. The record of the proceedings of the Board of Direction made since the last regular meeting of the Society shall be read at each regular meeting.

Sec. 19.—A nomination or proposal shall be presented at the next regular meeting of the Board of Direction following its receipt; when it is thereby approved, and the applicant (if for admission as Member, Associate or Junior) classed with his consent, a day shall be fixed for the ballot to be canvassed, which shall be at a regular meeting of the Society, not less than twenty-five days thereafter.

Sec. 20.—When such day is fixed, the Secretary shall conspicuously post in the room of the Society the name and class of the nominee or applicant, his residence, occupation, and the names of his proposers; he shall mail to each member whose address is known a notice of the same, with a letter ballot in such form as shall be prescribed by the Board of Direction, and request the recipient to vote thereby or in person in the usual manner on the day fixed, when an open canvass of the votes cast shall be made, and the result announced.

Sec. 21.—The proposers of any rejected candidate may, within three months after such rejection, lay before the Board of Direction written evidence that an error was then made, and ask for a reconsideration of the proposal, which shall be granted on sufficient grounds, and if a ballot has been taken, another shall be ordered.

Sec. 22.—Persons who shall be elected members of this Society after six months of any fiscal year shall have expired, shall pay only one-half of the amount of dues for that fiscal year, otherwise required.

Sec. 23.—Special committees to report upon engineering subjects shall be authorized only by a majority of the votes cast by the Society, and in the following manner: Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument for and against the appointment of such committee, which statement shall be printed

and issued to the Society with letter ballot ; or, if the Board fails to report within one month, the letter ballot shall be issued without comment ; or, the Society may vote by ballot at the Annual Meeting or in Annual Convention upon such resolution, within one month after it has been submitted to the Board of Direction.

Sec. 24.—1st. Votes for officers of the Society at the annual meeting in November may be sent by mail, inclosed in two sealed envelopes, the outer one of which shall be indorsed with the voter's signature, and all such votes shall be counted on the first ballot for officers.

2d. If it should appear that for any office a majority of the votes cast were not for one person, the meeting shall proceed to vote by ballot in the usual way for such officer, the choice of candidates being limited to the two persons not elected for whom the greatest number of votes had been previously cast for such office. In case three or more names have received an equal number of votes, the choice shall be made from among those names.

3d. At the Annual Convention a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention. This committee shall present to the Board of Direction, on or before the first day of October ensuing, the names of the persons selected by them as candidates for officers. Of these at least one Vice-President, three Directors, the Secretary and the Treasurer shall be resident members.

4th. The Board of Direction shall thereupon cause such list to be posted in the rooms of the Society, and shall issue, at least twenty days before the Annual Meeting, a letter ballot containing the names thus proposed.

5th. Any five members, not officers of the Society, may present to the Board of Direction, on or before October 1st, a list of names proposed by them for officers, which list or lists shall also be issued for ballot.

6th. No member of any Nominating Committee shall be presented by such committee as a candidate for office.

*Sec. 25.—*The President of the Society shall have the general supervision of the business and correspondence of the Society ; he shall be an Honorary Member of all committees, but shall have no vote on such committees. In all cases where the By-Laws or resolutions of the Society or of the Board of Direction require specific duties to be performed by the President, the senior resident Vice-President present shall perform such duties in absence of the President, on receiving notice from the President to perform such duties.

*Sec. 26.—*Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast shall be necessary for the adoption of any such addition or amendment.

AMENDMENTS PROPOSED TO THE CONSTITUTION.

[The following amendments have been regularly offered and seconded—They were discussed at the annual meeting, November 6th, 1878, and action upon them taken as stated. They will be submitted to letter ballot.]

[B.] Amendments proposed to Article V.

At the Annual Meeting it was recommended that this be not adopted.

Article V.—The officers of the Society shall consist of a President, three Vice-Presidents, five Directors, a Secretary, a Treasurer and a Librarian, all of whom, except the Librarian, shall be members of at least five years standing.

The President, Vice-Presidents, and Directors shall constitute a Board of Direction, and shall be the Trustees of the Society under the provisions of chapter 319 of the Laws of the State of New York, passed April 12th, 1848.

[C.] Amendment proposed to Article V.

At the Annual Meeting it was recommended that this be not adopted.

Article V.—The officers of the Society shall be a President, three Vice-Presidents, five Directors, a Secretary, a Treasurer, and a Librarian. The President, Vice-Presidents and Directors shall be members of at least five years standing, and shall constitute a Board of Direction and be the Trustees of the Society, under the provisions of chapter 319 of the Laws of the State of New York, passed April 12th, 1848.

[D.] Amendment proposed to Article V.

At the Annual Meeting it was recommended that this be not adopted.

To amend Article V, so far as relates to the election of a Secretary, as follows :

Hereafter the Secretary shall be appointed by the Board of Direction, and hold his office during its pleasure. This amendment shall take effect on its passage and its provisions shall apply to the Secretary elected in November next.

[E.] Amendment proposed to Article VI.

At the Annual Meeting it was recommended that this be not adopted.

Article VI.—The members of the Board of Direction shall be elected by the Society by written ballot at the Annual Meeting of the Society, and shall hold their offices until others are elected.

Their term of office shall begin on the first of January succeeding the Annual Meeting, and shall continue one year, or until their successors are elected.

Any vacancies occurring during the year shall be filled by the Board of Direction.

The Secretary and Librarian and Treasurer shall be appointed by the vote of not less than six members of the Board of Direction and shall

* See page 93.

hold office until removed by resignation or by a vote of not less than six members of the Board,

The duties of the Secretary and Librarian may be united in the same person if the Board so direct.

[F.] Amendment proposed to Article VI.

At the Annual Meeting it was recommended that this be not adopted.

Strike out the words, "The duties of Secretary and Librarian may be united in the same person if the Board so direct," and substitute for them the words, "The office of Librarian may be filled by an Associate or Junior, or its duties may be united in the same person with those of the Secretary."

[G.] Amendment proposed to Article VI.

At the Annual Meeting it was recommended that this be not adopted.

Strike out the same words as above, and substitute for them the words, "The offices of Secretary and Librarian may be filled by an Associate or Junior, and the duties may be performed by one and the same person."

[H.] Amendment proposed to Article VII.

At the Annual Meeting it was recommended that this be not adopted.

Article VII.—During the interval between the Annual Meeting and the first of January next ensuing, the President-elect shall appoint a Standing Committee of three on Finance, and of three on Library, from members of the Board for the ensuing year.

[I.] Amendment proposed to Article IX.

At the Annual Meeting it was recommended that this be not adopted.

Article IX.—The Secretary shall superintend the house of the Society, conduct the correspondence, edit the publications, issue all orders for supplies, and keep the books of account and records, all under the instructions of the Board of Direction and the Standing Committees. He shall receive such compensation for his services and such allowance for clerical aid as the Board of Direction may from time to time determine.

[J.] Amendment proposed to Article X.

At the Annual Meeting it was recommended that this be not adopted.

Article X.—The Treasurer shall have charge of the funds of the Society, receive all moneys and pay all bills which have been certified by the Secretary and approved by the Finance Committee. He shall give bonds in the sum of five thousand dollars, for the faithful performance of his duties, which bonds shall be approved by the Board of Direction. He shall deposit the moneys and invest the funds of the Society in its name and by and with the advice of the Board of Direction. All disbursements shall be made by checks signed by him.

[K.] Amendment proposed to Article XVII.

At the Annual Meeting it was recommended that this be adopted.

Article XVII.—A Member shall be a Civil, Military, Mining or Mechanical Engineer, who has been in active practice as such for seven years, or has graduated as Civil Engineer and been in practice for five years, and has had responsible charge of work as Chief, Resident or

Superintending Engineer for at least one year ; not as a skillful workman merely but as one qualified to design as well as to direct public work.

An Associate shall be a manager of a railroad, canal or other public work ; a geologist, chemist or mathematician ; a proprietor or manager of a mine or metallurgical works ; an architect or a manufacturer, or one who, from his scientific acquirements or practical experience, has attained eminence in his special pursuit, qualifying him to co-operate with engineers in the advancement of professional knowledge ; but shall not himself be practicing as an engineer.

A Junior shall be one who has had actual practice in some of the branches of civil, military, mining or mechanical engineering, for not less than two years ; or if a graduate of a scientific or collegiate institution—for not less than one year.

A person to be eligible to any class of membership must not be less than twenty-one years of age.

[L.] Amendment proposed to Article XVIII.

At the Annual Meeting it was recommended that this be adopted :

Article XVIII.—Nominations and proposals for admission to the Society shall be indorsed by at least five Members, who certify that they personally know the nominee or candidate, and that he is worthy of acceptance. The proposal of Member, Associate or Junior shall contain a statement, over the candidate's signature, of his age, residence, the nature and term of his professional service, and that he will conform to the requirements of membership, if elected. Fellows shall not be required to present themselves as candidates ; those making the nomination shall state the ground therefor, and certify that the nominee will accept if elected.

A proposal for transfer from one class to a higher shall be made by at least five Members, and shall state the age of the candidate, and the nature and term of his professional service since his admission to the Society. Such statement shall show a degree of qualification sufficient to render the proposed eligible to election in the class to which transfer is asked. Upon the approval of the Board of Direction, the candidate shall be balloted for, as provided in the election of members ; and when the transfer is made, he shall be required to pay as an additional entrance fee the amount of the difference between the entrance fees of the two classes.

[M.] Amendment proposed to Article XIX.

At the Annual Meeting it was recommended that this be not adopted :

Article XIX.—Elections for active members shall be by letter ballot, and the result shall be announced at the next regular meeting held after twenty-five days have elapsed from the time of mailing the notification. Five or more ballots cast in the negative shall exclude.

In case of the non-election of any person balloted for, no publication thereof shall be made.

[N.] Amendment proposed to Article XXIII.

At the Annual Meeting it was recommended that this be adopted :

Article XXIII.—Honorary Members, not exceeding twenty in number in all, may be appointed by a unanimous vote of the Board of Direction and the Past Presidents of the Society. A person to be eligible as an Honorary Member shall be a gentleman of acknowledged eminence in some branch of engineering. Honorary Members shall be subject to no fees or assessments and shall not be entitled to vote.

[O.] Amendment proposed to Article XXXII.

At the Annual Meeting it was recommended that this be adopted :

Article XXXII.—Proposed amendments to this Constitution must be submitted in writing, signed by not less than five Members on or before the first Wednesday in October, and then sent by letter to the several Members of the Society, at least twenty-five days previous to the Annual Meeting. Such amendments shall be in order for discussion at such Annual Meeting and shall be voted upon by letter ballot, the vote to be counted at the first regular meeting in February. An affirmative vote of two-thirds of all ballots cast shall be necessary to secure the adoption of any amendment.

[P.] Amendment proposed ; a new article.

At the Annual Meeting it was recommended that this be adopted :

Article—(A new Article).—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, and who from ill-health, advanced age, or other good reason assigned, is unable to pay such dues ; and the Board may remit the whole or part of assessments in arrears, or accept in lieu thereof, desirable additions to the Library and Museum.

AMENDMENTS PROPOSED TO THE BY-LAWS.

[R.] Amendment to Section 1.

At the Annual Meeting it was recommended that this be adopted :

SECTION 1.—The regular meetings of the Society shall be held on the first Wednesday in each month. There shall be meetings of the Society held on the third Wednesday in each month, for professional improvement, and the encouragement of social intercourse among men of practical science, at which papers shall be read and subjects discussed relating to the theory and practice of engineering, and no other business transacted. The Board of Direction may suspend meetings of the Society in the months of July and August.

A Convention of the Society for professional discussion and social intercourse shall be held annually at such place as the Society may determine, and be presided over by a Chairman selected from among members not officers of the Society. During the Convention, a regular meeting of the Society, to be presided over by the officers of the Society, may be held for the transaction of business.

On the evening of the first day of the Convention, there shall be held .

a meeting to which the public may be invited, and at which the President of the Society shall deliver an address giving a summary of engineering progress during the preceeding year.

[S.] Amendment to Section 23.

At the Annual Meeting it was recommended that this be adopted :

SECTION 23.—Special committees to report upon engineering subjects shall be authorized only by a majority of the votes cast by the Society, and in the following manner : Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument for and against the appointment of such committee, which statement shall be printed and issued to the Society with letter ballot ; or, if the Board fails to report within one month, the letter ballot shall be issued without comment.

[T.] Amendment to section 24, second clause.

At the Annual Meeting it was recommended that this be not adopted :

2d. The person having the greatest number of votes for the respective offices shall be declared elected. In case of a tie the decision shall be by ballot of the members present.

RESOLUTION SUBMITTED TO LETTER BALLOT.

The following resolution was presented at the meeting of the Society, held August 7th, 1878, and in accordance with the By-Laws was referred to the Board of Direction.

It was then submitted to letter ballot with the arguments for and against, as printed below, and the ballot being canvassed October 2d, 1878, the resolution was lost.

Resolved, That a committee of five be appointed by the President to investigate and report upon the conditions calculated for maximum economy in the use of steam in steam engines.

ARGUMENT FOR.

The causes which prevent the full utilization in an engine, of the steam generated by the fuel are various. The proportional effect of each of such causes and the best means of reducing such effect, are questions on which great diversity of opinion exists. These questions can best be solved by an analysis of the record of work done by existing machines when working under various conditions. Such an analysis can best be made by a committee of experts working under the auspices of the Society. A committee of this kind can obtain facts which could not be procured by individuals working separately, and can discuss and analyze the data collected in a manner not possible by independent observers. The aim of the resolution is the collection, in useful form, of information of value to all who are interested in steam engine economy, and is therefore in furtherance of the objects of the Society.

ARGUMENT AGAINST.

The determination of the relative effect produced by each of a multiplicity of causes working together cannot be reasoned out on general principles, but can only be made by several series of analytical experiments, in each of which care is taken to have one element variable while the others remain constant.

A committee of the kind proposed could not undertake such experiments, which would necessarily be expensive.

Published reports of the performance of different types of engines are so notoriously inexact and incomplete as to preclude the possibility of the deductions drawn from them being useful for a close analysis. The committee would be obliged, however, to base their conclusions on incomplete data, or else supplement them by theoretical reasoning. The report of a committee of this Society should be based on incontrovertible facts, and not be open to the criticism that where facts failed unsupported theory was called in to their aid.

For these reasons the appointment of the committee at this time seems unadvisable.

MEMOIRS OF DECEASED MEMBERS.

HENRY TYSON,* Member A. S. C. E.

DIED SEPTEMBER 1ST, 1877.

Henry Tyson was the son of Nathan and Martha Ellicott Tyson, and was born in the City of Baltimore on the 17th of October, 1820, and died in Baltimore on the 1st of September, 1877. He was descended from ancestors on both sides who were distinguished for vigorous intellects, and for their active exertions in favor of philanthropic measures, and who had been connected for several generations with the business and prosperity of the City of Baltimore.

He received his education partly at the collegiate department of the University of Maryland, in Baltimore, and afterward his studies were completed under the tuition of Samuel Smith, in Wilmington, Del.

In 1844 he was threatened with pulmonary disease, and for that reason spent the winter in traveling through the West Indies, and while there was attacked by the yellow fever. After his recovery, all traces of his former disease of the lungs entirely disappeared. In 1845 he made a voyage to Rio de Janeiro, and in 1846 another to the West Indies. During this last voyage his vessel was wrecked in mid-ocean, and the captain entirely disabled by a blow from a falling spar. The crew of the vessel became disorganized, and the vessel and all on board were in great danger of being lost, and probably would have been, had it not been for the presence of mind and ability of Mr. Tyson, who, with almost no one to help him, short of provisions, and without light at night, navigated the dismantled vessel into the harbor of St. Thomas, thus saving the cargo and the lives of all on board.

In 1847 he engaged in the flouring mill business in Baltimore, but his health again failing, he left the city, and resided for several years in the country, near Baltimore. In 1853 he was elected President of the Manteo & Perseverance Mining Company of North Carolina, and was actively engaged in engineering works in connection with the improvement of the mining properties, until he resigned the presidency. In 1856 he was appointed Master of Machinery of the Baltimore & Ohio Railroad. He occupied that position for about five years, and then, owing to some disagreement with the President of that company, his connection with the road was severed. During his administration, the

* Committee to prepare memoir, M. N. Forney, William R. Hutton, and John Bogart.

Board of Directors instructed him to prepare plans and specifications for freight engines for their road. Those used theretofore for the freight traffic had been chiefly eight-wheeled connected engines built by Winans and known as "Camel" engines. Mr. Tyson reported that these engines were very injurious to the track, and were very badly constructed, and recommended the use of ten-wheeled engines, that is, engines with six connected driving-wheels and a four-wheeled leading truck. Winans, instead of conforming to the ideas of Mr. Tyson and building ten-wheeled engines, undertook to show, in a series of letters published in the daily papers, that he (Tyson) was wrong. Public interest became very much excited, and the Board of Directors finally called upon Mr. Tyson for further information. He therefore addressed a note of inquiry to the subordinate officers in his department on the line of the road, asking for their opinion of the relative merits of the Camel and ten-wheeled engines. The replies unanimously condemned the Camel engine. These were then published in a pamphlet, and distributed through the length and breadth of the land, and had the effect of entirely breaking up Mr. Winans' business, so that he ultimately sold off all his machinery and pulled down his shops.

The final solution, which time has worked, of the question which was then so warmly discussed, is that locomotives with eight wheels connected and without trucks are now not used in this country, but instead the Consolidation pattern is employed, with eight wheels connected, but with a truck having a single pair of wheels in front.

The system of sewerage adopted in 1860 for the City of Baltimore was devised by Mr. Tyson, but is still uncompleted. In 1861 he was elected President of the Baltimore City Passenger Railroad, which position he held for thirteen years. The plan for the improvement of Jones Falls (which, it may not be known, is a stream of water which flows through the centre of Baltimore in a very contracted channel, and is therefore subject to frequent overflow) which was adopted by the Mayor and City Council of Baltimore, was also the work of Mr. Tyson. He was appointed one of three commissioners to carry it out, but owing to a disagreement among them this was never done, and the plan was finally abandoned on account of its supposed excessive cost. In having his plan adopted and carried out, he was again opposed by Mr. Winans, who attempted in every way to show that the plan was inadequate or defective.

Mr. Tyson's plan for the introduction of the temporary water supply in Baltimore was the one finally adopted in 1872 by the City Council, at a saving of \$200,000 over the plan previously agreed upon.

In 1873 he was elected Fourth Vice-President of the Erie Railway Company, with the duties of Superintendent of Machinery. He held this position only for a short time and then returned to Baltimore, where he was engaged in various matters pertaining to engineering. In 1875 he was appointed Receiver of the Chesapeake & Ohio Railroad, but re-

tired from that office in a few months. Soon after he was appointed Shipping Commissioner of the Port of Baltimore, and held that position at the time of his death.

He was a member of the American Society of Civil Engineers, although he never took an active part in its proceedings.

In social relations he was very popular, and owing to the versatility of his knowledge and wonderfully retentive memory, and, more than all, to his warm-hearted impulses, was much esteemed as a companion and friend. He had a wonderful power of exciting enthusiastic friendship and admiration among the subordinates in his employ. His conduct was uniformly courteous and respectful to all, from the highest to the lowest, and his salutation on entering his office in the morning to the half-witted man who swept it out was as respectful as it would have been to the president of the company.

Mr. Tyson was one of the few men who, during an active life, in which there was much experience calculated to embitter him, retained through all of it a love of doing good to others, especially if they were weak or helpless, and his chivalric devotion to the old and those in want or suffering, and his tenderness to little children, were marked characteristics.

He was independent almost to a fault, and incapable of anything like adulation for the purpose of securing the aid or good will of those whose influence or wealth would have helped him.

The most prominent traits of his character were not those which command wealth and power, but they caused all to respect him, and inspired in his friends and those much nearer to him the strongest and most ardent affection.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Architecture. The Old House Altered. George C. Mason. New York. 8vo, illus. *Putnams*. \$2.50.

Bridges. Maximum Stress in framed Bridges. William Cain. New York. 16mo, illus. *Van Nostrand's Science series*, No. 38. \$0.50.

Chemistry. Elementary and Quantitative Analysis. Alexander Classen. With notes and add. by Edgar F. Smith. Philadelphia. Roy. 12mo, illus. *H. C. Lea*. \$2.00.

— A Dictionary of Chemistry and the Allied Branches of other Sciences. Henry Watts, assisted by eminent scientific and practical chemists. Five vols. 8vo, cloth. \$50.25. Ditto, first supplement \$11.25. Ditto, second supplement \$13.50. *Longmans*, London. *Worthington*, New York.

— Handbook of Modern Chemistry. Inorganic and Organic. For the Use of Students. Chas. Mcynott Tidy. Philadelphia. 8vo. *Lindsay & Blackiston*. \$5.00.

— Manual of Introductory chemical practice, for the use of students in colleges and normal and high schools. Geo. C.

Caldwell and Abram A. Breneman. 2d ed rev. and corr. New York. 8vo. *Van Nostrand*. \$1.50.

Coins. The Early Coins of America; and the Laws governing their Issue. Comprising also descriptions of the Washington Pieces, the Anglo-American Tokens, many pieces of unknown origin of the seventeenth and eighteenth centuries, and the first patterns of the U. S. Mint. Sylvester S. Crosby. Boston. 4to, illus., heliotype plates. *Ester & Lauriat*. \$10.00.

College Book. Edited by Charles F. Richardson and Henry Alden Clark. Comprising historical and descriptive accounts, principally by professors or graduates, of twenty-four leading American Universities, Colleges, and the United States Military and Naval Academies, with excellent heliotype illustrations of one or more buildings connected with each of these institutions. New York. 8vo, illus. *Houghton, Osgood & Co.* (Announcement.)

Cyclopedia. Goodhulmes' Domestic Cyclo

- paedia. Todd S. Goodholme. New York. 8vo, illus. *Henry Holt & Co.* \$5.00.
- Dictionary, Brande & Cox. A Dictionary of Science, Literature and Art. W. T. Brande and G. W. Cox. New ed. Imp. and enl. 3 vols. 8vo. *Longmans*, London. *Worthington*, New York. \$22.00.
- Ure's — of Arts, Manufactures and Mines. Vol. IV. Supplementary to 7th ed. Robert Hunt. 8vo, illus. *Longman*, London. *Worthington*, New York. \$12.50.
- Ure's — 7th ed. Complete in 4 vols., including supplement. 8vo, illus. *Longmans*, London. *Worthington*, New York. \$36.00.
- Directory of the Engineers and Iron and Metal Trades and Colliery Proprietors throughout England, Scotland and Wales, and the principal towns in Ireland. 3d. ed. London. Roy. 8vo. *Kelley*, 30s.
- Electric Lighting: A Practical Treatise. By Hippolyte Fontaine. Translated from the French by Paget Higgs, Assoc. Inst. C. E. With 48 engravings. *Spence*, London and New York. \$3.00.
- Encyclopedia of Civil Engineering, Cressy's. 1 vol. 8vo, illus. *Longmans*, London. *Worthington*, New York. \$13.50.
- Engineering. Pioneer —. A Treatise on the Engineering Operations connected with the Settlement of Waste Lands in New Countries. By Edward Dobson, A. I. C. E. London. Crown 8vo, illus. and plates. *Crosby, Lockwood & Co.* 10s. 6s.
- Geometry. Elementary Treatise on Co-ordinate Geometry. By Prof. DeVoslon Wood, New York. *Wileys*. (Announcement.)
- Theory of concentric spheres. By Symmes. Louisville. 8vo. *Bradley & Gilbert*. \$0.50.
- Geometrical Drawing, an elementary course, Containing Problems on the Right Line and Circle, Conic Sections and other Curves, the Projection, Section, and Intersection of Solids, the Development of Surfaces, and Isometric Perspective. George L. Vose. Boston 4to, plates. *Lee & Shepard*. \$5.00.
- Hygiene, Naval. An essay on the various influences affecting Human Health, and the various means of preventing Disease, etc. Joseph Wilson, M.D., Medical Director U. S. N. 2d ed. Philadelphia. 8vo, illus. *Lindsay & Blackiston*. (Announcement.)
- Industries of Great Britain. Presenting a vivid, clear, and comprehensive Hist. of each of the Great Industries, described in all their various aspects. Fully illus. Vol. I. Extra. Crown 4to. *Cassell, Pitter & Gulpin*. London and New York. \$3.00.
- Land-cape Art in England in 1878. A. Dawson. London. 8vo. *Deighton & Dunthorne*. 1s.
- London. Catalogue of the Maps, Plans, and Views of London, collected by F. Grace, giving the title and size of each. London. 8vo. J. G. Grace. 21s.
- Mechanics, Weisbach's. Vol. II., Part III. — Heat and Steam Engines. Julius Weisbach. Translated by Prof. A. J. Du Bois. With Notes on American Practice by R. H. Buel. New York. 8vo. *Wileys*. \$6.00.
- The Amateur Mechanic's Workshop. Plans and Concise Directions for Manipulating Wood and Metals, including Casting, Forging, Brazing, Soldering and Carpentry. By the author of "The Lathe and its Uses." Ills. 6th ed. London. 9vo. *Trubner*. 6s.
- Mills and Millwork. A Treatise by Sir William Fairbairn. 4th ed. London. 8vo. *Longmans*. 25s.
- Mineralogy. Dana's Manual of Mineralogy. New ed., almost entirely rewritten and brought up to date. New York. 12mo, cloth. *Wileys*. \$2.00.
- Brush, G. J. Manual of determinative mineralogy; with introd. on blow-pipe analysis (constituting the determinative part of Dana's mineralogy.) 3d. ed., tr. into the new system. George J. Brush. New York. 8vo, cloth. *Wileys*. \$3.50.
- Painters, Sculptors, Architects, Engravers, and their Works. A Handbook, with many illustrations and monograms. By Clara Erskine Clement. 6th ed. re. and enl. Boston. Crown 8vo. *Houghton, Osgood & Co.* \$3.25.
- Parks: Its Parks and Gardens. Considered in relation to the wants of other cities, and of public and private gardens. 2d. ed. enl. and rev., with upwards of 350 ills. W. Robinson. New York. 8vo. *Macmillan & Co.* \$7.50.
- Political Register and Congressional Directory. A Statistical Record of the Federal Officers—Legislative, Executive, and Judicial—of the United States, 1776-1878. By Ben Perley Poore, Clerk of the Senate Record. Boston. 1 vol. 8vo. *Houghton, Osgood & Co.* \$6.00.
- Precious Stones and Gems. E. W. Streeter. New York. 8vo. *Nesbiter & Welford*. \$9.00.
- Railways. Sketches, Historical and Descriptive. With practical information as to Fares and Rates, &c., and a Chapter on Railway Reform. By Joseph Parslow. London. Crown 8vo. *G. K. Paul & Co.* 6s.
- Sanitary Examinations of Water, Air, and Food. By Cornelius B. Fox, M.D. Illus. 8vo. Philadelphia. *Lindsay & Blackiston*. (Announcement.)
- Science. Half-hour Recreations in Popular Science. Second Series, Containing: Transmission of Sound by the Atmosphere, by John Tyndal; The Telephone, by Prof. F. J. Garbit, M.D.; The Phonograph, by Prof. F. J. Garbit, M.D., etc. Boston. Large 12mo. 1 vol. Estes & Lauriat. \$2.50.
- Handbooks for Students and General Readers in Science, Literature, Art and History: The Studio Arts, by Eliz. Winthrop Johnson; Astronomy, by R. S. Ball; Vertebrata, by A. McAlister, M.D. New York. 16mo. *Henry Holt & Co.* (Announcement.)
- The American Science Series for High Schools and Colleges: Physics, by A. M. Mayer; Chemistry, by Sam. W. Johnson and William G. Mixer; Astronomy, by Simon Newcomb and Edward S. Holden; Geology, by Raphael Pumpelly; Botany, by C. E. Bessey; Zoology, by A. S. Packard, Jr.; The Human Body, by H. Newell Martin; Psychology, by Wm. James; Political Economy, by Francis A. Walker; Government, by Edwin L. Godkin. New York. *Henry Holt & Co.* (Announcement.)
- Scientific Memoirs: being Experimental Contributions to a Knowledge of Radiant Energy. John William Draper. With por. New York. 8vo. *Harpers*. \$3.00.
- Sound: a series of simple, entertaining, and inexpensive experiments in the phenomena of sound, for the use of students of every age. Alfred M. Mayer. New York. 12 mo, illus. (Experimental Science Series for Beginners, No. 2.) *Appletons*. \$1.00.

Steam Engine. A History of the Growth of the Steam Engine. Robert H. Thurston. New York. 12mo., illus. (Internat. Scientific Ser. V. 24.) *Appletons.* \$2.50.
 ———— Handbook of the ————
 John Bourne. 12 mo., illus. *Longmans*, London. *Worthington*, New York. \$2.00.
 ———— Recent improvements in the Steam Engine. With 124 wood-cuts. Foolscap, 8vo. John Bourne. *Longmans*, London. *Worthington*, New York. \$2.50.
 Tables and Memoranda for Engineers. J. C.

Hurst. 3d ed., rev. London. 34mo. *Spens.* 1s.
 University of Oxford: Examination of Women over Eighteen Years of Age. Examination Papers for the year 1878, with the list of Examiners and the Regulations. London. 8vo. *Parker.* 1s. 6d.
 ———— Local Examinations. Examination Papers for the year 1878, with list of Delegates and the Examiners, and the Regulations and Notices Prefixed. London. 8vo. *Parker.*

ANNOUNCEMENTS.

There were but nine Grand Prizes given to American Exhibitors at the Paris Exposition of this year. One of these was to the American Society of Civil Engineers for its Exhibit illustrating American Engineering.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, That Members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions

by the metric system, in connection with those of the system in general use.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

THE Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITION.

MEMBERS.

	Date of Election.
ANSLEY, GEORGE D.....City Surveyor, Montreal, Canada.....	Sept. 4th, 1878
BAKER, WILLIAM L.....(Admitted as Junior, January 6th, 1875); Ass't Engineer Detroit Bridge and Iron Works, Detroit, Mich.....	Nov. 6th, 1878
HOWARD, FREDERICK B...(Admitted as Junior, March 3d, 1875); Civil Engineer, Abstract Building, Detroit, Mich.....	" "
SITES, WILMON W. C.....City Surveyor, Board of Public Works, Jersey City, N. J.....	" "
STEARNS, FRED. P.....Ass't Eng. Boston Water Works, South Framingham, Mass.....	Oct. 2d, 1878
TIDD, MARSHALL M.....Civil Engineer, 46 Court St., Boston, Mass.....	" "

RESIGNATION.

DA COSTA, JOHN C. (Member).....Oct. 10th, 1878.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV., August,* 1878

THE ANNUAL REPORT OF THE BOARD OF DIRECTION FOR THE YEAR ENDING NOVEMBER 6TH, 1878. PRESENTED AND ACCEPTED NOVEMBER 6TH, 1878.

The Board of Direction, in compliance with Article XII of the Constitution, herewith presents a "Report on the affairs of the Society, embracing the Report of the Treasurer" for the term from November 7th, 1877, to November 6th, 1878.

On November 7th, 1877, the membership in the Society was :

Honorary Members, resident....	2	Non-resident....	4	Total.....	6
Corresponding Members.....	—	"	3	"	3
Members, resident.....	110	"	325	"	435
Associates, "	4	"	12	"	16
Juniors, "	9	"	46	"	55
					506
Making.....	125		390		515
Fellows, 68— of whom 10 Members and 1 Honorary Member are included above, leaving.....					57
Total connected with the Society, November 7th, 1877					572

To-day the membership in the Society is :

Honorary Members, resident....	2	Non-resident....	4	Total.....	6
Corresponding Members.....	—	"	3	"	3
Members, resident.....	120	"	334	"	454
Associates, "	4	"	13	"	17
Juniors, "	8	"	49	"	57
					528
Making.....	134		403		537
Fellows, 67—of whom 10 Members and 1 Honorary Member are included above, leaving.....					56
Total connected with the Society, November 6th, 1878.....					593

* These proceedings are carried up to November 6th, 1878. The explanation of this is given in the previous number.

The increase during the year has been :

Members admitted.....	25,	resigned, 5; died, 1;	increase....	19
Associates admitted.....	1,		increase....	1
Juniors admitted.....	5,	transferred to member. 3;	increase....	2
Fellows admitted.....	0,	died, 1;	decrease....	1
<hr/>				
Total admitted	31;	less, resigned 5, transferred 3,		
died 2.....	10			
<hr/>				
Making net increase	21			21

On November 7th, 1877, there were as stated in last report of Board, 8 proposals pending ; 30 proposals have been received during the year ; 24 candidates have been elected as members, of whom 3 were transferred from Juniors; 1 candidate has been elected as Associate and 5 candidates have been elected as Juniors; 2 persons elected previous to November 7th, 1877, and 23 elected since that date, have qualified during the year as Members; 1 Associate and 5 Juniors elected since that date have qualified as such during the year; 1 candidate elected as Member during the year has not yet qualified, and there are six proposals now pending.

24 meetings of the Society were held during the year, one of which was the Tenth Annual Convention; a meeting has been held on the first and third Wednesdays of each month, the ordinary recess during the summer not having been this year taken; 19 meetings of the Board of Direction have been held during the year.

The Tenth Annual Convention was held in Boston, June 18th and 19th, 1878. This was followed by visits to various engineering works and points of interest in the City of Boston, and by excursions on the line of the water works, to places in the harbor, to Lowell, to Lawrence, to the White Mountains and over the White Mountain Railway, and by visits to Providence and Fall River.

Members of the Boston Society of Civil Engineers, of the Engineers' Club of St. Louis, of the Engineers' Club of the North West, of the Engineers' Club of Philadelphia, and other visiting engineers were present.

Full reports of the Convention have been published in Proceedings.

Reports made during the year were as follows :

By the Board of Direction : The Annual Report for the year. Also a report upon a ballot for membership; a report upon a ballot for adoption of a memorial; a report in reference to resolutions and By-Laws referred to it, embodying a proposed codification of the existing Constitution and By-Laws of the Society; also the regular reports upon the applications for admission to the Society sent out with the letter ballots.

By the Finance Committee ; 1 Report.

By the Treasurer ; 2 Reports.

By the Board of Censors for the award of the Norman Medal ; 1 Report.

By the Centennial Commission of the Society ; 2 Reports.

By the Committee on the Exhibition at Paris ; 2 Reports.

By the Committee on Tests of American Iron and Steel ; 2 Reports.

By the Committee on Gauging of Streams ; 2 Reports.

By the Committee on Resistances of Railway Trains ; 1 Report.

By the Committee on Uniform Accounts and Returns of Railroad Companies ; 2 Reports.

By the Committee on Permanent Quarters for the Society ; 2 Reports.

By the Committee on Nomenclature and Classification of Masonry ; 1 Report.

By the Committee on the Metric System ; 1 Report.

By the Committee on time and place of Tenth Annual Convention ; 1 Report.

By the Committee on Nominations ; 1 Report.

By the Committee to Select Commissioner at Paris ; 1 Report.

The following papers and discussions have been published during the year ;

Relative Quantities of Materials in Bridges of different kinds, of various heights ; C. E. Emery. (No. CXLIX.)

Description of Survey for Determining the Slope of Water Surface in the Erie Canal ; W. H. Searles. (No. CL.)

Discussion of Connected Arc Marine Boilers ; J. F. Flagg.

Nomenclature of Building Stones and of Stone Masonry ; J. James R. Croes, William E. Merrill and Edgar B. Van Winkle. (No. CLI.)

Discussion on Levees as a System for Reclaiming Low Lands ; J. F. Flagg.

Notes and Experiments on the Use and Testing of Portland Cement : William W. Macley. (No. CLII.)

On Igniting Blasts by Means of Electricity ; J. H. Striedinger. (No. CLIII.)

A Peculiar Case of Failure in a Water Main ; D. McN. Stauffer. (No. CLIV.)

Discussion on a Peculiar Case of Failure in a Water Main ; George S. Greene, jr., W. H. Paine, C. L. McAlpine, and Wm. J. McAlpine.

The Improvement of the South Boston Flats by the Harbor Commissioners of the State of Massachusetts ; E. S. Philbrick. (No. CLV.)

On a New Method of Detecting Overstrain in Iron and other Metals, and on its Application in the Investigation of the Causes of Accidents to Bridges and other Constructions ; R. H. Thurston. (No. CLVI.)

Steam Engine Economy, a uniform basis for comparison ; C. E. Emery. (No. CLVII.)

The Incline Plane Railroad at Madison. Its History and Operation. M. J. Becker. (No. CLVIII.)

On the Theoretical Resistance of Railroad Curves ; S. Whinery. (No. CLIX.)

Discussion on the Resistance of Railroad Curves ; O. Chanute, C. E. Emery, E. Yardley, Edward P. North, C. L. McAlpine, F. Collingwood and W. H. Paine.

On the Cause of the Maximum Velocity of Water Flowing in Open Channels being below the surface ; James B. Frances. (No. CLX.)

The Flow of Water in Pipes under Pressure ; Charles G. Darrach. (No. CLXI.)

Discussion on the Cause of the Maximum Velocity of Water Flowing in Open Channels being below the Surface, and also on the Flow of Water in Pipes under Pressure ; Theodore G. Ellis, C. E. Emery, C. Herschel, De Volson Wood and J. T. Fanning.

The South Pass Jetties ; Descriptive and Incidental Notes and Memoranda ; E. L. Corthell. (No. CLXII.)

Discussions on the South Pass Jetties ; Charles W. Howell, E. L. Corthell, C. Shaler Smith and J. Foster Flagg.

Papers and notes of discussion have been presented during the year, in addition to those published, as follows :

Brick Arches for Large Sewers ; R. Hering.

Discussion on Arches for Large Sewers ; W. Milnor Roberts.

Accident to Arch at Brooklyn ; F. Collingwood.

Discussion on the Relative Quantities of Material in Bridges ; W. H. Searles.

Accident to Cable at Brooklyn Bridge ; F. Collingwood.

Fall of Western Arched Approach to South Street Bridge, Philadelphia ; D. McN. Stauffer. On Cements ; D. J. Whittemore.

On American Cements and Bricks ; F. Collingwood.

The Law of Tidal Currents in River Harbors ; J. H. Striedinger.

The Mediterranean Currents ; Charles H. Haswell.

On Wing Dams ; Theodore G. Ellis.

Brush Mattress Dams ; J. Dutton Steele.

On the Means for Checking the Movement of the Falls of St. Anthony ; E. P. North.

The Dynagraph ; R. H. Buel.

- Reminiscences and Experiences of Early Engineering Operations with especial reference to Steep Inclines ; W. Milnor Roberts.
 On Incline Planes ; O. Chanute.
 On Incline Planes ; W. H. Paine.
 On the Nomenclature of Building Stones and of Stone Masonry ; J. Foster Flagg.
 On the Nomenclature of Building Stones and of Stone Masonry ; J. J. R. Croes.
 On a Newly Discovered Relation between the Tenacity of Metals and their Resistance to Torsion ; R. H. Thurston.
 Observations on the Stresses Developed in Metallic Bars by Applied Forces ; T. Cooper.
 On Stresses in the Eye Bar Head ; De Volson Wood.
 Distribution of Rain-fall during the Great Storm of October 3d and 4th, 1869 ; James B. Francis.
 On Gauging of Streams ; C. Herschel.
 The Dangers threatening the Navigation of the Mississippi River, and the Reclamation of its alluvial Lands ; B. M. Harrod.
 On Sewers ; E. S. Chesbrough.
 On Steam Engine Economy ; E. D. Leavitt, Jr.
 On Steam Engine Economy ; J. Foster Flagg.
 On Railways Curves ; J. Dutton Steele.
 Graphic Method of Railroad Accounts ; C. Latimer.
 The Gravity of Water ; F. Collingwood.
 The Flow of Water in Small Channels, after Ganguillet and Kutter, with Kutter's Diagram modified and graphical Tables with special reference to Sewer calculations : R. Hering.

The Proceedings contain, in addition to the reports mentioned :

- Announcements in reference to discussions, ballots, illustrations of papers, donations to the library, times of meetings, members visiting Europe, the tenth annual Convention, reviews and extracts of papers of this Society published abroad, complete sets of Society Transactions, discordant standards of measurement, the Norman Medal, and papers for distribution.
 Lists of Additions to the Library and Museum of the Society.
 Lists of Additions to Membership and of Resignations and Deaths.
 Lists of Changes and Corrections of Address of Members.
 Letters of Invitation to Members of this Society from the Society of German Engineers.
 Memoirs of deceased Members of the Society.
 Memorial adopted on subject of extension of triangulations of the Coast Survey.
 Minutes of the Meetings of the Society and of the Board of Direction and of the Convention at Boston.
 Monthly lists of new books on Engineering and Technology.
 Notes and memoranda in reference to the Exhibit of American Engineering at Paris, the Metric System of Weights and Measures, the Board to test Iron and Steel.
 Notes as to the performance of the earlier engines on the Philadelphia and Reading Railroad.
 Proposed Amendments to the Constitution and By-Laws.
 Volume VI. of Transactions, and Volume III. of Proceedings closed with the December number, and Title Page and Index for each were issued with the January number.

Several years since, a handsome plate for Certificates of Membership in the Society was engraved, and a number of blanks on parchment, parchment paper, and plate paper were printed. An announcement was made, that on the payment of a sum stated, to cover the actual cost, a certificate would be forwarded to each member desiring it. Many were ordered and paid for but none were delivered, on account, as stated in the report of former boards, of an undecided question as to the time when the membership of an elected candidate begins.

During the past year, 105 Certificates of Membership have been finally

prepared, and all forwarded to the members who have ordered them, except a few which are waiting the signature of one of the former officers of the Society, who it is expected will soon be in New York, when they also will be completed and delivered.

The Board of Direction elected November 7th, 1877, held its first meeting for organization on Nov. 14th. The interval of a week allowed by the Constitution between the election and the first meeting of the Board was taken so that the non-resident members might have notice of and opportunity to attend this important meeting. It was then found that the last number of the Transactions that had been published was the one dated September, 1877. The next number was prepared directly and issued early in December; but, as will be seen, this was in the regular sequence headed as for October, thus really putting the heading of the number two months behind its actual issue. The Board has fully appreciated the desirability of regularity in publishing the Transactions; but, as will be explained in the statement as to finances, the necessity and great ulterior benefit to the Society of paying up its bills seemed so decided that it was considered best to make that the paramount work. Ten numbers have been published during the year. The remaining numbers, to bring the Transactions up to current dates, have been prepared in manuscript and can soon be published, as there are, at last, no financial difficulties to prevent.

The financial difficulties of the past year have been due to the fact that there were bills presented for liabilities incurred previous to the commencement of this year, and running back to 1874. It was found that the credit and good name of the Society were in danger, and it was determined to pay all these bills. The amount so paid, during the past Society year, of bills for liabilities incurred previous to the beginning of this year is \$2,786 33.

The balance transferred from the previous year was also reduced by the payment, during the last month of that year, of bills amounting to over \$1,000, which had been incurred during a period extending from December, 1872, to April, 1877.

The Board is happy to say that there are now no unpaid bills against the Society; that it transfers its control of affairs to its successors with no legacy of bills payable, and it congratulates the Society upon the fact, which it is believed exists for the first time in at least six years, that it is entirely out of debt.

It will be seen from the Report of the Treasurer that there are 117 members in arrears for dues, the amount of arrearages being \$5,285. The greater portion of these members are believed to be willing to liquidate their indebtedness, but to have been unable to do so in consequence of the great depression in business. Toward such members who express a desire to retain their membership, and who evince that desire by payment in instalments, as opportunity offers, the Board feels that a lenient policy is the most just; but toward those who take no notice of requests for, at least, a reply to respectful communications asking for payment of their indebtedness, but one course can be pursued, and it is proposed to take measures to compel payment after the first of January next. It is suggested that members in arrears who may possess books and reports, copies of which are not in the Library, should dispose

of them to the Library at market rates, the amount of the same to be credited to their account.

The library has been increased during the year by the following additions :

Number of Books bound.....	199
“ “ unbound.....	200
“ Pamphlets.....	378
“ Maps.....	10
“ Plans.....	32
“ Photographs.....	46
“ Drawings, Specifications, Models and Specimens.....	17

These do not include the magazines and papers contributed to the Society by publishers, or received in exchange for Transactions, as follows :—

American Architect and Building News.....	Weekly.....	Boston.
American Cyclopædia and Popular Science Monthly.....	Monthly.....	New York.
American Gas Light Journal.....	Semi-Monthly.....	“
Annales des Ponts et Chaussées.....	Quarterly.....	Paris.
Army and Navy Journal.....	Weekly.....	New York.
Builder.....	“.....	London.
Building and Engineering News.....	“.....	“
Commissioner of Patents Journal.....	Semi-Weekly.....	“
Deutsche Bauzeitung.....	“.....	Berlin.
Engineer.....	Weekly.....	London.
Engineering.....	“.....	“
Engineering and Mining Journal.....	“.....	New York.
Engineering News.....	“.....	Chicago.
Iron.....	“.....	London.
Iron Age.....	“.....	New York.
Journal American Iron and Steel Association.....	“.....	Philadelphia.
“ of Franklin Institute.....	Monthly.....	“
“ Society of Arts.....	Weekly.....	London.
Manufacturer and Builder.....	Monthly.....	New York.
Manufacturer and Iron World.....	Weekly.....	Pittsburg.
Monthly Record of Scientific Literature.....	Monthly.....	New York.
Polytechnic Review.....	Weekly.....	Philadelphia.
Railroad Gazette.....	“.....	New York.
Railway Age.....	“.....	Chicago.
Railway Review.....	“.....	“
Railway World.....	“.....	Philadelphia.
Scientific American.....	“.....	New York.
Telegraph Journal and Electric Review.....	Semi-Monthly.....	London.
Van Nostrand's Magazine.....	Monthly.....	New York.

The following are subscribed for :

Allgemeine Bibliographie für Deutschland.....	Weekly.....	Leipzig.
American Bookseller.....	Semi-Monthly.....	New York.
American Library Journal.....	Monthly.....	New York.
Bibliographie de la France.....	Weekly.....	Paris.
Bookseller.....	Monthly.....	London.
Journal of Artillery and Military Engineering.....	“.....	Vienna.
Publishers' Weekly.....	Weekly.....	New York.

The Society has received during the year, in exchange for its “Transactions,” official publications of the following associations, in some instances for preceding years :

Aeronautical Society of Great Britain.....	London.
American Institute of Architects.....	New York.
" Academy of Sciences.....	Washington.
" Institute of Mining Engineers.....	Easton, Pa.
Architecten und Ingenieur Verein zu Hannover.....	Hannover.
Argentine Scientific Society.....	Buenos Ayres.
Associação dos Engenheiros Cívis Portuguezes.....	Lisbon.
Austrian Society Engineers and Architects.....	Vienna.
Boston Public Library.....	Boston.
British Patent Office.....	London.
Civil Engineers' Club of the Northwest.....	Chicago.
" " Philadelphia.....	Philadelphia.
" " St. Louis.....	St. Louis.
Die Administration der "Mittheilungen".....	Vienna.
Engineer Department, U. S. A.....	Washington.
Essayons Club, Corps of Engineers, U. S. A.....	Willetts Point.
Imperial School	Moscow.
Institution of Civil Engineers.....	London.
" " of Ireland.....	Dublin.
" Engineers and Shipbuilders.....	Glasgow.
" Mechanical Engineers.....	London.
Iron and Steel Institute.....	"
North of England Institute of Mining and Mechanical Engineers.....	Newcastle-on-Tyne
Oesterreicher Ingenieur und Architekten Verein.....	Vienna.
Revue Générale des Chemins de fer	Paris.
Royal United Service Institution.....	London.
Russian Imperial Technic Society.....	St. Petersburg
Saxonian Society of Engineers and Architects	Dresden.
Smithsonian Institution.....	Washington.
Society of Arts.....	London.
" Engineers.....	"
Societe del Cuerpo de Ingenieros.....	Lima.
Société des Ingénieurs Cívis.....	Paris.
Stevens Institute of Technology.....	Hoboken.
Swedish Society of Engineers.....	Stockholm.
U. S. Light House Board.....	Washington.
U. S. Military Academy.....	West Point.
U. S. Naval Observatory.....	Washington.
U. S. Ordnance Department.....	"
U. S. Patent Office.....	"

The present state of the Library is about as follows:

Books and Pamphlets.....	7,487
Manuscripts.....	96
Maps, Plans, Drawings, Charts, Photographs and Engravings.....	1,884
Models and Specimens.....	208

No paper has been submitted during the past year for competition for the Norman Medal.

The Committees existing at the beginning of the year are still continued, except those on Nomenclature and Classification of Masonry, and on the Metric System of Weights and Measures.

A Committee charged with the preparation of an Exhibition of American Engineering, at the Paris Exposition, was appointed during the year, and it is expected will report at this time.

A Committee was appointed at the business meeting during the Tenth

Annual Convention, to examine into the methods of election of officers adopted by various clubs and societies, and to report a By-Law embodying such features of the various plans as may seem best adapted for this society. This Committee will report at this time.

The lease of the present Society House, will expire on the first of May next. The Committee on permanent quarters for the Society will report on this subject at this meeting.

Amendments to the Constitution adopted during the year, have been as follows :

ARTICLE XIX.—For “two” insert “five” and for “thirty” insert “twenty-five.” The article will then read :

All candidates for admission to the Society must file statements by themselves, setting forth the grounds of their claim to be elected; be proposed by at least five members of the Society, to whom they must be personally known, and a notification of the same sent to each member whose address is on record. Each proposition, with the names of the proposers, must be posted in some conspicuous place in the rooms of the Society for at least twenty-five days before being submitted to vote. All papers and applications shall be laid before the Board of Direction, and be reported upon previous to action by the Society.

ARTICLE XX.—In elections for membership of either class, members shall vote by letter or by ballot, in the usual way, and the result shall be announced at the next regular meeting held after thirty days have elapsed from the time of mailing the notification. Five or more ballots cast in the negative shall exclude. Members notified, but not responding, shall be classed as voting in the affirmative.

ARTICLE XXII. (To read).—Persons thus elected and duly qualified, who reside within fifty miles of the Post Office in the City of New York, shall be deemed resident; and those who reside beyond this limit shall be deemed non-resident. The membership of any person shall begin on the day of his election.

ARTICLE.—(A new Article.)—Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

ARTICLE.—(A new Article.)—Upon the written request of ten or more members, that for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charge against him, and present a written defense. Two months after such advice was given, the Board of Direction shall finally consider the case, and if resignation has not been tendered or a satisfactory defence made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall in any event, be the only public announcement of the matter.

Amendments to the By-Laws adopted during the year have been as follows:

(A new Section.)—In all cases where the By-Laws or resolutions of the Society or of the Board of Direction require specific duties to be performed by the President, the senior resident Vice-President present shall perform such duties in absence of the President, on receiving notice from the President to perform such duties.

SECTION 26.—Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast shall be necessary for the adoption of any such addition or amendment.

The following clause was stricken out from section 23.

[The term Junior is to be understood as not referring to the age of the person, but to his

classification in the Society for the time being. He is Junior to Members in the sense that his professional experience has had a more limited scope than theirs, while he is eligible to become a Member, which an Associate is not,]

The Board, as was reported at the last meeting of the Society, has caused a codification to be made of the existing provisions of the Constitution and By-Laws.

Amendments have been offered, which are to be debated by the Society to-day.

The Secretary has, under direction of the Board, taken active measures to recover the value of a certificate for five shares of the stock of the New York Central Railroad Company, which certificate was lost, some ten years ago, by the former Treasurer of the Society. These measures have finally been successful, and the Board takes pleasure in stating that the value of the original shares, and the accumulated dividends, has been recovered. The amount placed in the treasury of the Society from this source, after paying all expenses, is, at par, \$1,475.79.

Deaths of members during the year have been:

John F. Tracy, elected, as fellow, January 20th, 1873, who died February 13th, 1878, and a memoir of whom has been published.

C. Ridgely Schott, elected, as Member, April 1st, 1874, who died July 9th, 1878, of whom a memoir is in preparation.

Although not a member of the Society, Mr. Benjamin H. Latrobe was so prominent in our profession that the Board takes this occasion to announce his death, which occurred at Baltimore on the 19th of October, 1878, in the seventy-first year of his life. Mr. Latrobe was one of the pioneers of the engineering profession in this country. He took a most prominent part in the construction of the great railroad system from its infancy to its present full development. His bold design of ascending the Allegheny Mountains with steep grades, which he afterward carried out so successfully, received, as it merited, the admiration of engineers, and established for Mr. Latrobe a reputation as one of the foremost engineers of his time throughout the civilized world, which he has sustained by his works, and his personal character, to the end of his useful life.

Respectfully submitted,

JOHN BOGART,

Secretary,

REPORT OF THE TREASURER

FOR THE YEAR ENDING NOVEMBER 6TH, 1878.

Presented and Accepted at the Twenty-sixth Annual Meeting.

RECEIPTS.

Balance on hand November 7th, 1877.....	\$634 67
Entrance fees	775 00
Current dues—from 88 Resident Members	\$2,162 50
Do. from 270 Non-resident Members	3,937 50
Do. from 5 Resident Juniors	75 00
Do. from 44 Non-resident Juniors	439 88
Do. from 3 Resident Associates	45 00
Do. from 7 Non-resident Associates.....	65 00
	6,754 88
Past dues—from 6 Resident Members.	\$175 00
Do. from 18 Non resident Members	375 00
	550 00
Dues for year beginning Nov. 6th, 1878:	
From 13 Resident Members	\$325 00
From 95 Non-resident Members.....	1,416 55
From 14 Non-resident Juniors.....	140 00
From 2 Non-resident Associates	20 00
	1,901 55
Sales of Publications.....	283 21
Certificates of Membership.....	36 75
Miscellaneous	33 75
Proceeds of 5-20 Bond—Fellowship Fund—called in.....	\$527 96
Interest on Fellowship Fund Bonds	560 00
Interest on Savings Bank Deposit.....	63 22
Interest on Norman Medal Fund.....	70 00
Accumulated Dividends on recovered Railroad Stock.....	975 79
	2,196 97
	\$13,166 78

DISBURSEMENTS.

Rent	\$1,600 00
Janitor, House Supplies, Fuel, Furniture, Water and Gas.....	897 21
Library	119 82
Publications.....	1,943 70
Insurance.....	34 23
Postage.....	337 94
Salaries.....	3,000 00
Stationery and Printing.....	492 36
Norman Medal and Book Prize.....	128 15
Annual Meeting and Convention.....	300 71
Certificates of Membership.....	49 80
Other expenditures.....	128 80
Publications previous to Nov. 7th, 1877.....	\$1,516 50
Rent do. do.	400 00
Salaries do. do.	58 33
Legal services do. do.	160 88
Miscellaneous bills previous to Nov. 7th, 1877.....	650 62
	<hr/> 2,786 33
	<hr/> \$11,819 03
Transferred to Investment Account: See Statement here- with.....	\$598 22
Balance on hand....	749 51
	<hr/> 1,347 73
	<hr/> \$13,166 78
	<hr/>

The funds of the Society are invested as follows, par values being stated:

Fellowship Fund:

8 Bonds Jersey City Water Loan.....	\$8,000 00
Deposit in Seamen's Bank for Savings.....	886 12
	<hr/> \$8,886 12

Norman Medal Fund:

1 Certificate Croton Aqueduct Stock, New York City.....	1,000 00
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General Investment:

10 Shares New York Central and Hudson River R.R. Stock.....	1,000 00
1 Consolidated Certificate New York Central and Hud- son River R.R. Stock.....	35 00
	<hr/> 1,035 00

There is due to the Society from its members for arrears of dues the sum of \$5,285 00, distributed as follows:

46	Members owe for 1 year.....	\$780 00
19	do. do. 2 do.	610 00
22	do. do. 3 do.	1050 00
8	do. do. 4 do.	540 00
9	do. do. 5 do.	775 00
11	do. do. 6 do.	1330 00
2	do. do. 7 do.	200 00
<hr/>		
117	Members owe	\$5285 00

J. J. R. CROES,

Treasurer.

REPORTS OF COMMITTEES.

REPORT OF THE COMMITTEE ON FINANCE.

PRESENTED AND ACCEPTED NOV. 6TH, 1878.

The Committee on Finance would respectfully present the following report for the year ending November 6th 1878:

The balance on hand, reported November 6th, 1877, was.....	\$634 67
Outstanding indebtedness.....	1,810 58
Leaving a balance of indebtedness of.....	1,175 91
The receipts for the present fiscal year, as reported by the Treasurer, are	12,532 11
The expenditures have been	11,819 05
including the indebtedness left over from last year.	

The committee would respectfully refer to the Secretary's and Treasurer's reports for the items of the foregoing summary, and would remark that the systematic arrangement of all of the accounts, not only with each individual debtor and creditor, but also with each appropriation fund, has been carried out in so thorough and practical a man-

ner as to greatly lessen the labors of your committee.

Notwithstanding the efforts of the previous committee, we found there were still old outstanding bills and unsettled accounts.

The calling for receipts in full by our Treasurer has, we trust, brought in all such accounts, the number and amounts of which have been a matter of surprise and a severe drain upon our treasury.

The total amount of such bills paid during this year has been \$2,786.33, to which we might properly add the amount of more than \$1,020 presented near the close of last year, all of which has been withdrawn from the available funds of this year.

Your committee has brought this matter to the attention of the Board of Direction, which has taken action in appropriating funds and ordering these bills paid, which action now places our Society entirely free from debt.

REPORT OF COMMITTEE ON TESTS OF AMERICAN IRON, STEEL, AND OTHER METALS.

PRESENTED FOR THE COMMITTEE BY WILLIAM SOOY SMITH, CHAIRMAN.

The Committee submits as a report the fact that the Board to Test American Iron and

Steel is legislated out of existence just as its work is fairly begun.

REPORT OF THE COMMITTEE ON GAUGING OF STREAMS.

PRESENTED FOR THE COMMITTEE BY J. J. R. CROES, CHAIRMAN.

The Committee on Gauging of Streams respectfully reports that during the past summer some measurements have been taken of the minimum flow of the Passaic River, and some of its branches in New Jersey, the results of which they hope soon to be able to lay before the Society. The officers of the Geological Survey of New Jersey have expressed great interest in the efforts of the Committee, and anticipate the establishment, at an early day, of systematic measurements of the streams in portions of that State.

The Committee desires to call attention to the very interesting report of General Theodore G. Ellis on the measurements of the flow of the Connecticut River, made under the direction of the United States Engineers for several years, which report has recently been published by the War Department.

The system of measurement, and the results obtained, are therein fully detailed, and will be of great benefit to observers desiring to establish similar systems of gauging.

REPORT OF COMMITTEE ON PERMANENT QUARTERS FOR THE SOCIETY.

PRESENTED FOR THE COMMITTEE BY JOHN BOGART, CHAIRMAN.

The Committee on Permanent Quarters for the Society begs to report that as the lease of the present Society House expires on the 1st of May next it will be necessary to determine whether it is best to renew it.

It will be inexpedient to move the Society effects unless there are strong reasons of economy or convenience for doing so. But the rent paid for this house is quite large, and it would be very desirable, if possible, for the Society to be properly accommodated at a lower rental. It is therefore suggested that the Board of Direction should ascertain

whether a reduction of rental can be obtained—should ascertain whether other convenient quarters can be found at a rental sufficiently less to warrant removal, and should determine the question upon the combined considerations of economy and convenience.

The Committee have kept in view the general desire of the Society to secure, at the earliest practical period a suitable building of their own, or one of which a permanent lease might be advisable; but it is well known that this is not immediately attainable.

LETTER FROM THE PRESIDENT OF THE SOCIETY,

PRESENTED AT THE TWENTY-SIXTH ANNUAL MEETING, NOVEMBER 6TH, 1878.

CHICAGO, Nov. 2d, 1878.

To the Members of the American Society of Civil Engineers:

Gentlemen,—On reaching the close of the term of office with which I feel the Society has greatly honored me, a custom that should not lightly be disregarded demands some statement from me, relative to the progress, condition, and prospects of the Society in particular, and of our profession in general.

I have to acknowledge, however, that the distance of my home from the central office, and the restraining circumstances, both private and official, in which I have been, and still am, placed here have prevented me from

attending a single meeting of the Society during the year. While this has been a source of great regret, it has also been to me very gratifying to know that the duties of the office have been so ably performed by the Senior Vice-President, who, I rejoice to believe, is to be my successor. Under these circumstances, it would be a useless waste of your time for me to undertake to enlighten you in regard to matters with which the Senior Vice-President and the Secretary are so much better acquainted than I am.

My correspondence and my limited intercourse with the officers named, satisfy me that the financial affairs of the Society have

been very prudently managed—a vital necessity in these times, when so many institutions, as well as individuals, are struggling for existence. Could the Society own a suitable building for its meetings, library, and other purposes, it would, no doubt, be greatly relieved from restrictions that limit its usefulness. But, under present circumstances, it would seem almost a mockery to suggest such a thing; yet we believe the dawn of better times is upon us. The object is certainly most worthy, and the failure of a former effort in the same direction should not prevent the subject from being kept constantly in view. There are, no doubt, members of the Society—perhaps many—who feel very favorably disposed toward such an object, who cannot at present contribute anything, but who will, very probably, be relieved from existing embarrassments in the near future. Such persons might be induced to follow a custom so often practised with regard to other institutions—that is, to provide something for a building fund in their wills, with the intention, however, of being their own executors as soon as circumstances will permit. Others—and it is believed there are at least a

few such—are abundantly able to give now, and would willingly do so if they felt assured their contribution would be put into the hands of such a responsible and permanent board or commission as would secure the faithful application of their funds—or returned to them or their heirs, in case a sufficient amount should not be raised for the purpose.

The same causes that have prevented me from attending the meetings of the Society have also prevented me from making myself sufficiently acquainted with the general condition and progress of Civil Engineering in this and other countries to enable me to present the subject in a satisfactory manner. To simply repeat what others have already said on the subject would not be worthy of your time.

Allow me, gentlemen, to express not only my heartiest wishes for the prosperity and usefulness of the Society and for the happiness of its members, but my belief that it is to participate in the achievements and honors that await our profession in the early future.

With great respect,

E. S. CHESBROUGH.

MEMOIRS OF DECEASED MEMBERS.

CHARLES RIDGELY SCHOTT,* Member A. S. C. E.

DIED JULY 9TH, 1878.

Charles Ridgely Schott, was born in Baltimore, Maryland, on November 11th, 1847. He graduated at the Rensselaer Polytechnic Institute, as Civil Engineer in 1868, and was immediately appointed Assistant Engineer on the Hannibal and St. Joseph Railroad, in which position he was engaged on a variety of construction and other work until February, 1869, when he was promoted to the charge of a division, including the Quincy Bridge across the Mississippi river. In June, 1870, he left this position in consequence of malarial fever and was engaged as an Assistant Engineer on the Kansas Pacific Railroad, in topographical work and construction until February, 1871, when he was transferred to the charge of the Chief Engineer's office at Lawrence.

Returning to the East shortly after, he was in the employ of the Boston Franklinite Company until August, 1871, when he was appointed

* Committee to prepare memoir, J. James R. Cross and John Bogart.

an Assistant Engineer in the Topographical Bureau of the Department of Public Parks. During his service in this position he conducted a very thorough triangulation of the Harlem river and Spuyten Duyvil Creek, and was also engaged on the topographical surveys of the territory since annexed to the City of New York.

In June, 1874, he was promoted to the position of Division Engineer, and after December, 1875, was virtually the principal assistant on the work of laying out streets, etc.

The gradual advances of pulmonary disease, which was hereditary in his family, compelled him to relinquish active duty in his office in January, 1878, and at length terminated his life on the 9th day of July, 1878.

In all the positions to which he was assigned, Mr. Schott won the respect and regard of his superiors by his strict attention to his duties and the more than ordinary intelligence displayed in their performance. These qualities, in addition to the strict integrity of his character, seemed to give promise of his attaining a prominent rank in the profession, when his career was brought to an untimely end by disease.

Mr. Schott was elected a member of the Society, April 1st, 1874.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

- Architecture. Palliser's Model Houses, with designs for dwellings, barn, hennery, stable, carriage-house, school-house, bank, library, town-hall and three churches. 2d ed. rev. 8vo, illus. Bridgeport, Conn. *Palliser & Co.* \$1.00.
- Building Construction — Masonry. R. Scott Burn. London. 2 vols. Text. 2s. 6d. Plates, 5s. *Collins.*
- Carpentry. R. Scott Burn. London. 2 vols. Text 2s. 6d. Plates, 4s. *Collins.*
- Campaign of 1776 around New York and Brooklyn, with circumstantial account of the battle of Long Island. H. P. Johnston. Brooklyn, N. Y. 8vo. 6 maps. 4 por. *Long Island Historical Society.* \$4.00.
- Carriage Act — Metropolitan Public. 1869 (32 and 33 Vict. c. 115), and Order made by the Secretary of State, 10th March, 1871; together with Abstract of Laws relating to Proprietors, Drivers, and Conductors of Public Carriages, and Penalties for Misconduct. With Appendix of Additional Statutes, &c., and Copious Index. Fcap., 8vo. London. *Government Publication.* 4d.
- Casting and Founding. Practical treatise on ——— in l. descriptions of modern machinery employed. N. E. Spretson. London and New York. 8vo, illus. *Spon.* \$7.00.
- Ceramic Art, a compendium of the history and manufacture of pottery and porcelain. J. J. Young. New York. 8vo, illus. *Harpers.* \$5.00.
- Colleges, American — : their students and their work. C. F. Thwing. New York. 16mo. *Pulmser.* \$1.00.
- The American ———, and the American Public; with afterthoughts on College and School Education. Noah Porter. New York. 12mo. *Stribners.* \$1.50.
- Conferences held in connection with the Special Loan Collection of Scientific Apparatus 1876; Chemistry, Biology, Physical Geography, Geology, Mineralogy and Meteorology (South Kensington Museum). Post. 8vo. London. *Chapman & Hall.* 6s.
- Conferences Held in Connection with the Special Loan Collection of Scientific Apparatus. 1876; Physics and Mechanics (South Kensington Museum). Post. 8vo. London. *Chapman & Hall.* 6s.
- Crystallography. H. P. Gurney. London. 8vo, illus. *Soc. Prom. Chris. Know.* 1s.
- Cyclopedia, Domestic ——— of practical information. T. B. Goodholme. New York. 8vo, illus. *H. Holt & Co.* \$5.00.
- Drawing, Elementary course of Geometrical ——— George L. Vose. Boston. 4to, illus. *Lee & Shepard.* \$5.00.
- Engines, Examples of Steam, Air, and Gas Engines of the most Approved Types, as Employed in Mines, Factories, Steam Navigation, Railways, and Agriculture, Practically Described. With an Account of all the Principal Projects for the Production of motive Power from Heat which have been propounded in different Times and Countries. 54 Plates, and 358 Woodcuts. John Bourne. London. 4to. *Longmans.* 70s.

- Encyclopedia—Analysis of Zell's ———. T. W. McClintock. Philadelphia. Fol. Zell, Davis & Co. \$2.50.
- Governor. The ———. Sir T. Elyot. Edited with notes, glossary, &c., by Herbert Croft. London. 2 vols. Small 4to. C. K. Paul & Co.
- Highways and Bridges, Chambers (G. F.) The Law relating to—bring the Statutes in full, and Brief Notes of 700 Leading Cases, in a convenient form for reference. For use of Officers of Municipal Corporations, Local Boards, and Highway Boards, and of Justices' Clerks. To which is added the Law relating to Lighting of Rural Parishes under the "Lighting Act, 1833." G. F. Chambers. London. 8vo. *Sterens & Sons*. 18s.
- Machine Construction. Edward Tomkins, edited by Henry Evers, London. 2 vols. Text. 3s. 6d. Plates 7s. *Collins*.
- Mechanic. The Universal Assistant and complete ———. R. Moore. New York. 12mo. illus. *Albert Cogswell*. \$2.50.
- Military Sketching and Reconnoissance—by Lieut. Col. F. J. Hutchison and Capt. H. G. Macgregor—(being Vol. I. of Military Handbooks for Officers edited by Lieut. Col. C. B. Brackenbury. R. A.) London. Small 8vo. C. K. Paul & Co. 6s.
- Mineral Statistics of the United Kingdom for 1877. Memoirs of the Geological Survey. R. Hunt. London 8vo. *Longmans*. 2s.
- Newspaper—American ——— directory with lists of all the newspapers and periodicals published in the U. S., territories, Canada and Newfoundland; with description of the towns and cities in which they are published. October, 1878. New York. 8vo. G. P. Rowell & Co. \$0.50.
- Oxford. Its Social and Intellectual Life. With remarks and Hints on Expenses, the Examination, the Selection of Books, etc. Algernon M. M. Stedman. New York 12mo. *Scribner & Welford*. \$3.75.
- Paris International Exhibition, 1878: Coal and Iron in all Countries of the World. Compiled from Official Sources, and with the assistance of eminent living Authorities. Job Pechar. London. 8vo. *Heywood*. 5s.
- Steam Boilers: their strength, construction and economical working. Robert Wilson. London. 5th ed. 12mo. illus. *Crosby Lockwood & Co.* 6s.
- Steam Engine. A Course of Lectures on the Steam Engine, Delivered to the Students of Dynamical Engineering in the University of Pennsylvania. By Wm. D. Marks, Whitney-Professor of Dynamical Engineering. Philadelphia, 12mo. illus. *Lippincott*. (Announcement.)
- Surveying—Howard (W. F.) Practice of Underground Surveying and Advocacy of Contoured Mining Plans, &c. With 5 tables and Diagram. W. F. Howard. London. 8vo. *Spons*. 2s.
- Telegraph—Handbook of the Electro-Magnetic Telegraph. A. E. Loring. New York. 18mo. *Van Nostrand*. \$0.50.
- Water and Fuel Supply, chiefly in reference to the British Islands. Surface Waters. D. T. Ansted. London. 8vo. *W. H. Allen*. 18s.
- Zuyder Zee—The dead cities of Holland. Henry Havard. Trans. by A. Wood. New York. 12mo. illus. *Scribner & Welford*. \$3.00.

ANNOUNCEMENTS.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, That Members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

THE Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV., September, 1878.

(Up to December 18th.)

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

NOVEMBER 20TH, 1878.—The Society met at 8 P. M., W. H. Paine in the chair.

A paper entitled "Submarine Telephoning," by Charles W. Raymond, was read by the author, and discussed by Messrs. G. S. Greene, Jr., Collingwood and Dresser.

A paper, by John Bogart, giving the results of enquiries addressed to engineers of railways in Great Britain as to the "Construction of Permanent Way," was read by the author, and discussed by Messrs. Andrews, J. C. Campbell, Chanute, Collingwood, Dresser, A. Fink, G. S. Greene, Jr., Haswell, Macdonald, W. H. Paine and Worthen.

DECEMBER 4TH, 1878.—The Society met at 8 P. M., Vice-President Roberts in the chair.

The ballots upon admission to membership were canvassed and the following candidates were declared elected: as members, James E. Childs, of Rochester, N. Y., and Malcolm S. Greenough, of Boston, Mass.; as Junior, Christopher L. Gates, of Milwaukee, Wis.

A paper, by D. McN. Stauffer, entitled "The use of Compressed Air in Tubular Foundations, and its application at South Street Bridge, Philadelphia," was read by the Secretary, and discussed by Messrs. Collingwood, Dresser, Macdonald, Roberts, Searles and Striedinger.

DECEMBER 18TH, 1878.—The Society met at 8 P. M., W. H. Paine in the chair.

A paper, presented at the annual meeting, as part of the Report of the Committee on Resistances of Trains, giving a record of the evaporative efficiency of certain locomotives as calculated by P. H. Dudley, was read, and discussed by Messrs. J. C. Campbell, Cooper, Forney, Haswell, Leverich, W. H. Paine and Worthen.

OF THE BOARD OF DIRECTION.

NOVEMBER 12TH, 1878.—The Board met, organized, and the following standing committees were appointed :

On Finance : William H. Paine, C. Vandervoort Smith, George S. Greene.

On Library : Albert Fink, J. J. R. Croes, Thomas C. Clarke.

DECEMBER 4TH, 1878.—Applications for membership were considered. Business was transacted in reference to arrears of dues. Appropriations were made.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Astronomy. R. S. Ball. Specially revised for America by Simon Newcomb. New York. 16mo. *Holt & Co.* \$0.60
 Books. On the right use of them. Prof. W. P. Atkinson. Boston. 16mo, *Roberts Bro's.* \$0.60.
 Bridge and Roof Construction. Karl von Ritter. Trans. by Lieut. Sankey. London. *Spon.* (Announcement.)
 Cabinet-Maker ; the practical ——— ; a collection of working drawings with explanatory notes. London. 8vo. *Wymans.* 4s.
 Chart of the World, showing the Zoo-Geographical Regions according to Alfred Russell Wallace. By Dr. Andrew Wilson. Size 50 by 42 inches. Price, with Handbook, on rollers, varnished, 12s. *W. & A. K. Johnston*, Edinburgh and London.
 Chemical Qualitative Analysis; a short course. Prof. John H. Appleton. Philadelphia. 12mo. *Cowperthwait & Co.* \$0.90
 Cleopatra Needle (The): Its Transport from Alexandria to London, and its Erection on

the Thames Embankment. 1877-78. 3 Plates, 2 Diagrams. Copy of the Memorial Deposited in the Pedestal of the Cleopatra Needle, September 12th. 1878. Imp. 4to. *Engineering Office.* 1s.
 Coal Mine Explosions. John Higson. London. 8vo. *Heywood.* 7s. 6d.
 Coal Mine Gases and Ventilation. J. Miller. London. Post 8vo. *Longmans.* 10s. 6d.
 Electricity and Magnetism. Fleeming Jenkin. London. Fourth Ed., with Appendix on the Telephone and Microphone. Small 8vo, diagrams. *Longmans.* 3s. 6d.
 Electric Lighting; its State and Progress, and its probable influence upon the Gas Interests. John T. Sprague. London. 8vo. *Spons.* 1s.
 Friction and Lubrication, with new determinations of Laws and of co-efficients of Friction by new methods and with new Apparatus. Robert H. Thurston. New York. 12mo. *Railroad Gazette.* \$1.50.

- Health Manuals.** London. Each 8vo. *Sec. Prom. C. K.*
 On Personal care of Health. E. A. Parkes, 1s.
 Food. Albert J. Bernays. 1s.
 Water, Air and Disinfectants. W. N. Hartley. 1s.
 Health and Occupations. B. W. Richardson. 1s.
- Hydraulics.** Work done by, and power required for fire streams; together with tables and information rel. to hydraulics. Springfield, Mass. G. A. Ellis, 16mo, tucks. \$1.75.
- Hydrostatics and Pneumatics.** Philip Magnus. (London Science Class Books.) 18mo. *Longman.* 1s. 6d.
- Industries, British Manufacturing Industries, Metallic Mining.** New ed. 12mo. London. *Stamford.* 3s. 6d.
- Life Insurance,** algebraic discussions of the principles upon which calculations of legal net money values in the business are based. G. W. Smith. New York. 8vo. *Van Nostrand.* \$0.25.
- Locomotive Engines: Embodying the Modern Practice of Locomotive Engineering.** D. Kinnear Clark. Being an Enlargement of Dempsey's Treatise. London. *Crosby, Lockwood & Co.* (Announcement.)
- London.** Account of the Great Buildings of London. Historical and Descriptive. N. D'Auvres. Autotype, illus. M. Ward & Co. 6s.
- Masonry and stone cutting.** Rudiments of—E. Dobson. (Weales Series) New Ed. London. 12mo. illus. *Crosby, Lockwood & Co.* 2s. 6d.
- Microscope,** half hours with the——14th ed. With Chapter on the Polariscope by F. Kitten, and illustrations by Tuffen West. E. Lankester. London. 12mo. *Hardwicke & Bogue.* 2s. 6d.
- Mississippi River.** Review of Humphrey's and Abbot's rep. on the physics and hydraulics of the Mississippi river. Jas. B. Eads. New York. 8vo. *Van Nostrand.* \$0.25.
- Ornament: Polychromatic.** 100 plates in gold, silver and colors. Comprising upwards of two thousand specimens of the various styles of Ancient, Oriental and Mediaeval Art, and including the Renaissance and 17th 18th Centuries. With explanatory description to each plate, and a General History of the Art of Ornamentation. A. Racinet. London. Folio illus. *H. Sotheran & Co.* f6. 6s.
- Painting.** By Messrs. Crosby, Lockwood & Co. School of Painting for the Imitation of Woods and Marbles, as taught and practiced by A. R. and P. Van der Burg, Directors of the Rotterdam Painting Institution, London *Crosby, Lockwood & Co.* (Announcement.)
- Public Works of East India.** Report of select Committee, with evidence. *Parliamentary Publication.* 5s. 6d.
- Pyrotechnists' Treasury;** or complete art of making fireworks. Thomas Kentish. London. Crown 8vo. illus. Plates. *Chatto & Windus.* 4s. 6d.
- Railway Accidents.** Returns for half year to June, 1878. London. *Government Publication.* 1s. 3d.
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- Railway Ticket System.** To Whom are We indebted for the Railway Ticket System. Reprinted from the "English Mechanic and World of Science," Aug., 1878. *Blacklock.* (Manchester). 6d.
- Rule—Spiral slide.** Equivalent to a Straight Slide Rule, 83 feet 4 inches long, or a Circular Rule 13 feet 3 inches in Diameter (patent). Fcap. George Fuller. London. *Spon.* 6d.
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- Steam Engine.** The Relative Proportions of the Steam Engine. A course of Lectures on the Steam Engine, delivered to the Students of Dynamical Engineering in the University of Pennsylvania. William D. Marks, Whitney. Professor of Dynamical Engineering. Philadelphia, 12mo, illus. *Lippincott.* \$1.50.
- . Text Book on the ——
 T. M. Goodeve. London, 8vo, illus. *Crosby, Lockwood & Co.*
- Submarine Warfare,** offensive and defensive, with discussion of the offensive torpedo system, its effects upon iron-clad ship systems, and its influence upon future naval wars. Lt. Com. J. S. Barnes, U. S. N. New York. 8vo, illus. 20 plates. *Van Nostrand.* \$5.00.
- Survey of Hull, Equipments and Machinery** of Steam Ships carrying passengers. New ed. 1878. London. 8vo. *Putnam.* 1s. 6d.
- Surveyor's Main Road Account Book,** adapted for Keeping the Separate Accounts of the Maintenance of Main Roads as required by the Highways and Locomotives (Amendment) Act, 1878. 4to, sd. *Lech* (Wisbech). *Simpkin* (London). 4s.
- Tempering Scale.** Color Tempering Scale, printed in colors, by the aid of which any one can accurately temper any tool. Full instructions on Hardening and Tempering by Joshua A. Rose. How to make the Telephone, Phonograph, and Microphone, together with other valuable information from the late volumes of *Scientific American.* New York. *Wiley & Sons.* \$2.00.
- Vapors,** Report of Commission on Noxious Vapors. *British Government.* 6d.
- Weaving, The History and Principles of Weaving by Hand and by Power,** reprinted, with considerable Additions, from "Engineering," with a Chapter on Lace-making Machinery, reprinted from the "Journal of the Society of Arts." Alfred Barlow. London, 8vo, illus. *Low.* 25s.
- Weaving by Hand and Power. The History and Principles of.** Alfred Barlow. Philadelphia, 8vo. *Henry C. Baird & Co.* \$10.00.
- Wrinkles and Recipes.** Edited by Park Benjamin, Ph. D. Contains, beside the large original collection of valuable trade recipes for all classes of Mechanics and Engineers 50 new pages of important wrinkles and trade secrets. New ed. rev. and enl. New York. *Wiley & Sons.*

ANNOUNCEMENTS.

Announcement of the publication of books, papers or articles by members of this Society is requested to be made to the Secretary.

The annual meeting of the American Institute of Mining Engineers will be held at Baltimore on the third Tuesday of February next.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in

papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

CHILDS, JAMES E. Chief Engineer, Rochester and State Line	
R. R., Rochester, N. Y.	Dec. 4th, 1887
GREENOUGH, MALCOLM S. . Boston Gas Light Co., Boston, Mass.	" "

JUNIOR.

GATES, CHRISTOPHER L. . . Ass't Engineer Chicago, Milwaukee and	
St. Paul R.R., Milwaukee, Wis.	" "

RESIGNATIONS.

EMSLIE, PETER (Member)	Oct. 17th, 1878
FORD, JAMES K. "	Oct. 12th, 1878
HINES, DAUPHIN S. "	Oct. 10th, 1878

DECEASED.

REEVES, SAMUEL J. (Member)	Dec. 15th, 1878
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. IV., October, November and December, 1878.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

[NOTE.—The number of the Society Transactions issued at this time is consecutively headed as that for October, 1878. The next number will be the descriptive memoir and statement made by the Committee on the exhibit of American Engineering in Paris in 1878, reported at the Annual Meeting and then ordered published in the Transactions of the Society. Its length is that of two ordinary numbers, and it will be issued as for the months of November and December.

The proceedings have been in fact brought up to the end of the year 1878, the minutes of all the meetings of that year having been printed. Below is given a short abstract of the proceedings of meetings held since the beginning of the year. A more detailed report will be published in the regular Proceedings issued for January.]

At the regular meeting of the Society, held January 3d, 1879, the vote upon amendments to the Constitution and By-Laws was canvassed, and the recommendations made at the Annual Meeting as to the adoption or rejection of the several amendments were in each case carried.

The President, W. Milnor Roberts, announced that he was about to visit Brazil, professionally, and made a short address. A committee was appointed and a preamble and resolutions reported by it on the subject of the departure of the President were adopted.

At the meeting of January 15th, the subject of discussion was Resistances of Rolling Stock.

At the meeting of February 5th, the ballots for place of next Convention were canvassed, and it was found that the City of Cleveland had a majority of the votes. William H. Bradley, of Boston, and Hamilton Smith, Jr., of San Francisco, were elected members.

A paper on the Electric Light was read by Stephen Chester.

At the meeting of February 19th, a paper on Gelatine Dynamite was read by Julius H. Striedinger.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

- Architecture. A Handbook of Formula Tables and Memoranda for Architectural Surveyors and others engaged in Building. 12th ed., re-written and enlarged. John Thomas Hurst. London. 32mo. *Spons.* 5s.
- Arithmetic. Intuitive Calculations, or Easy and Compendious Methods of Performing the various Arithmetical Operations required in Commercial and Business Transactions. (Weale's Series.) 25th ed., corrected and enlarged by J. R. Young. Daniel O'Gorman. London. 12mo. *Crosby Lockwood.* 3s. 6d.
- Car Builder's Dictionary. New York. 8vo. *Railroad Gazette* (Announcement.) \$1.75.
- Cast Iron Pipes. Ernest Benedict. London. 8vo. *Spons.* 6d.
- Centennial Exhibition. Official Report descriptive of the Grounds and Buildings of the U. S. International Exhibition. Illustrated with Views of the Buildings and their Ground Plans, and the Official Situation Plans. Imperial 8vo. *Lippincott.* \$5.00.
- Chemistry. Elements of Modern Chemistry. Ad. Würtz. Paris. Trans. and Ed. by Wm. H. Green. Philadelphia. Illus. *Lippincott.* (Announcement.)
- A Treatise on Chemistry. Professors Roscoe and Schorlemmer. Manchester. Vol. II. Metals. Illus. *Appleton.* (Announcement.)
- Coal: its History and Uses, by Professors Green, Mial, Thorpe, Rücker and Marshall. New York. 8vo. *Macmillan.* \$4.
- The History of Coal; a Lecture at Kings College. Thomas Wiltshire. London. 8vo. *Spons.* 1s.
- Mine Gases. Ventilation, and Gases inclosed in coal. J. W. Thomas. London. 8vo. *Longmans.* 10s. 6d.
- Compressed air: Transmission of power by —. Rob. Zahner. New York. Van Nostrand, Science Series No. 40. *Van Nostrand.* \$0 50.
- Dictionary of Scientific Terms. William Rositer. London. 8vo, illus. *Collins.* 3s. 6d.
- Drawing Instruments. Treatise on Mathematical — with hints on coloring and drawing. W. F. Stanley, New York, 5th ed. 8vo, illus. *Spons.* \$2.40.
- Elasticity—from "Encyclopedia Britannica." W. Thomson. Edinburgh. 4to. *Black.* 4s.
- Electric Lighting; its state, progress and probable influence on gas interests. J. T. Sprague. New York. 8vo. *Spon.* \$0.40.
- on the present state of; J. N. Shoolbred, London. 8vo. *Hardwicke.* 1s.
- Light; its past history and present position. T. C. Hepworth. London. 12mo. illus. *Routledge.* 1s.
- An Illustrated Guide to its Production, Cost and Practical Application. With Descriptions of the various Inventions now before the Public. London. 12mo. *Ward and Lock.* 1s.
- Encyclopedia of Civil Engineering; Cressy's. 1 vol. 8vo. Longman, London. *Worthington.* New York. \$13.50.
- Engineers; Aide-Memoire for the use of officers of Royal Engineers. Compiled by Colonel A. C. Cooke, C. B., R. E., with Contributions and Assistance from other Officers. Vol. I. Formulae, Tables, Military Statistics, and Memoranda for the Field. London. 8vo. *Government Publication.* 12s. 6d.
- Calvert's Pocket Book and Annual for Engineers, Mechanics and Builders. London. 12mo. *Heywood.* 1s.
- Engines, Single and Compound; their relative merits. Portsmouth, England. *Griffin.* 4s. 6d.
- Field Engineer. A Handy Book of Practice in the Survey, Location and Track Work of Railroads. William Findlay Shunk, C. E., Chief Engineer of the Construction of the Metropolitan Elevated R. R., New York. *Van Nostrand.* (Announcement.)
- Gas. The history, manufacture, distribution and economical consumption of coal-gas; a lecture by Samuel Hunter. Manchester, England. 8vo. *Cornish.* 1s.
- Gunpowder and Gun Cotton; notes on. *British Government publication.* London. 1s.
- Gun, ram and torpedo; with diagrams and illustrations. Portsmouth, England. *Griffin.* 8s. 6d.
- Hampton Tracts. Condensed Statements of the Fundamental Laws of Health. Comprising: No. 1. Health Laws of Moses; No. 2. Duty of Teachers; No. 3. Preventable Diseases; No. 4. Who Found Jamie; No. 5. A Haunted House. Edited by Stephen Smith, M.D., General S. C. Armstrong, Miss H. W. Ludlow, and others. 16mo. *Putnam.*

- New York. 8c. per number; \$5 per hundred; \$40 per thousand.
- Heat. An elementary treatise on Heat. Wm. Garnett. 3d ed., rev. and enl. London. 8vo. Bell. 3s. 6d.
- Health, Dangers to —. A practical guide to domestic sanitary defects. T. P. Teale. London. 8vo. Churchill. 10s.
- Healthy Houses. Fleeming Jenkins. Edinburgh. 8vo. Plates. Douglas. 2s. 6d.
- Health Primers. Edited by eminent medical and scientific men of London.
1. Alcohol, its use and abuse. W. S. Greenfield, M.D.
 2. Exercise and Training. C. H. Rolfe, M.D.
 3. Premature Death; its promotion or prevention.
 4. The House and its Surroundings.
- Square 16mo. Appleton. New York. Each \$0.40.
- Edited by J. Langdon Down, Henry Power, J. Mortimer-Granville, and John Tweedy. Alcohol, its use and abuse. The House and its Surrounding. Exercise and Training. Premature Death; its promotion and prevention. London. Foolscap. 8vo. (Same as above. English edition.) *Hardwick & Bogue*. Each 1s.
- Hydraulic Engineering. The Hempstead Storage Reservoir of Brooklyn: its engineering theory and results. Samuel McElroy. New York. 8vo. Van Nostrand. \$0.50.
- Hydrometir. Manual of —. 2d ed., illus. Portsmouth, England. *Griffiths*. 3s. 6d.
- Hydrostatics and Pneumatics. P. Magnus. London Science Class-books. 18mo. Longman's. 2s.
- Map Drawing. A. Gardiner. London. 4to. Hughes. 1s.
- Mechanics. Appleton's Cyclopaedia of applied Mechanics. New ed. Ed. by P. Benjamin. New York. Appleton. (Announcement.)
- Metal Work: A series of more than 1,200 of the best Examples which have attracted attention at the various International Exhibitions, with treatises on the principal Industries which have produced them. By G. W. Yapp, Assistant Commissioner, and Compiler of the Official Catalogues of the Great English International Exhibition. London. Imp. 4to. Virtue & Co. £2 5s.
- Mineralogy and Lithology. A manual. Prof. James D. Dana. New York. 12mo. Wiley's. \$2 00.
- New York Illustrated. 4to. Appleton. \$0.60.
- Railways. Continuous Brakes. Return. London. *British Parliamentary Publication*. 6d.
- Science for all. Edited by Robert Brown. Vol. I. Illustrated. London. Roy. 8vo. Cassell. 9d.
- Ship—The Polyserphic ship and speed at sea. C. M. Rainus. London. 8vo. Stanford. 1s. 6d.
- The War Ships of Europe. Illus. Portsmouth, England. *Griffiths*. 10s. 6d.
- Statics and Hydrostatics. Elementary. J. Hamblin Smith. London. 8vo. Livingstone. 6s.
- Steam and Steam Engines, Land, Marine and Locomotive. Henry Evers. 3d ed., rev. and enl. (Collins' advanced Science Series.) London. 12mo. Collins. 3s.
- Steam Engine; Manual of the — and other prime movers. W. J. M. Rankine. 9th ed., revised by W. J. Millar. London. 8vo. Griffiths. 12s. 6d.
- Steam Vessels. Power and speed of — Calculated by rules adopted for vessels of all types. W. Bury. New York, 8vo. Spens. \$1.40.
- Stevenson. Life of Robert Stevenson, Civil Engineer. D. Stevenson. New York, 4to. Plates. Spens. \$3.00.
- Surveying—Nautical — from "Alston's Seamanship." Portsmouth, England. *Griffiths*. 2s. 6d.
- Telephone; the Speaking Telephone. Electric Light, and other recent electrical inventions. George S. Prescott. New edition enlarged, with illustrated descriptions of Edison's inventions. New York, 8vo, illus. Appleton. \$4.00.
- Telegraph—Instructions for Testing Telegraph Lines, and the Technical Arrangements of Offices. Written on behalf of the Government of India, under the Orders of the Director-General of Telegraphs in India. Vol. I. L. Schwendler. London, 8vo. Trubner. 12s.
- The Telegraph in America; its promoters and noted men. J. D. Reid. New York, 8vo, illus. Derby Bros. \$6.00.

ADDITIONS TO

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- From Administration des Ponts et Chaussées, Paris:
Annales, September, October, November, December, 1878.
- From Aeronautical Society of Great Britain, London;
Fred. W. Breary, Hon. Secretary. Reports from 1866 to 1877, inclusive.
- From American Chemical Society, P. Camsamajor, Secretary, New York:
Proceedings, Vol. I. and Nos. 1, 2 and 3, Vol. II.
- From American Institute Mining Engineers, Thomas M. Drown, Secretary, Easton, Pa.:
An Improved Universal Suspended Hydraulic Lift. J. A. Herrick. Easton, Pa. 1879.
- Imperfections in Surveying Instruments. J. Hy. Harden. Easton, Pa. 1879.
- New Determinations of the Coefficients of friction of Lubricated Journals, and on the laws governing such friction. R. H. Thurston. Easton, Pa. 1878.
- Notes on the Result of an Experiment with the Wheeler Process of combining Iron and Steel in the head of a Rail. W. E. C. Coxe, Easton, Pa. 1878.
- Proceedings of the Meeting at Lake George and Lake Champlain. Easton, Pa. 1878.
- The Butler mine fire Cut-off. H. S. Drinker. Easton, Pa. 1879.
- The Heat of the Comstock Mines. Prof. J. A. Church. Easton, Pa. 1878.
- The Jenks Corundum Mine. Macon Co., North Carolina. E. W. Raymond. Easton, Pa. 1878.

The Mechanical work performed in heating the Blast. Prof. B. W. Frazier, Easton, Pa. 1878.

From American Iron and Steel Institute. James M. Swank, Secretary, Philadelphia :

Directory to the Iron and Steel Works in the United States, corrected to September 1st, 1878. Philadelphia. 1878,

From Edward R. Andrews. Boston : The Teredo and its depredations. Extract from the Archives of Holland. Vol. 1. Translated by Edward R. Andrews. New York. 1878. (Copies for Distribution.)

Two Photographs of a Creosoted Railway Sleeper, twenty years in use on the North Eastern Railway of England.

From Argentine Scientific Society. D. Felix Amoretti, Secretary, Buenos Ayres : Annals of the Society. August, October, November, 1878.

From Austrian Society of Engineers. E. R. Leonhardt, Secretary, Vienna : Wochenschrift und Zeitschrift of the Society, from March to June, 1878, inclusive.

From John W. Bacon, Danbury, Conn. : Twenty-sixth Annual Report of the Railroad Commissioners of Connecticut. Hartford, Conn. 1878.

From Gen. John G. Barnard, U. S. A., New York ; Report of the Board of Officers appointed to examine the works in progress of construction by James B. Eads, at the mouth of the Mississippi River. Washington. 1879.

From Gen. S. V. Benet, Chief of Ordnance, U. S. A., Washington : Annual Report of the Chief of Ordnance, 1878. Washington. 1878.

From Charles E. Billin, Philadelphia : Report of Progress in the Juniata District, on the Fossil iron ore beds of middle Pennsylvania. John H. Dewees. Harrisburgh, Pa. 1878.

From Boston Public Library : Bulletin of Library. October. 1878. Boston.

From British Board of Trade, London : British Trade Journal. September 1st, 1878. London.

From W. D. Bullock, Pawtucket, R. I. : Lithograph, Corliss' Pumping Engine. New York. 1878.

From Bureau of Education, Washington : The training of Teachers in Germany. Washington. 1878.

From Bureau of Navigation, Washington :

The American Ephemeris and Nautical Almanac, for the year 1881. Washington. 1878.

From Hon. Allan Campbell, New York : Reports of the Department of Public Works, of the City of New York. Quarters ending June 30th and September 30th, 1878. Allan Campbell, New York 1878.

From E. S. Chesbrough. Chicago. Second Annual Report of the Department of Public Works of Chicago. E. S. Chesbrough. Chicago. 1878.

From Civil Engineers Club of the Northwest. L. P. Morehouse, Secretary. Chicago ;

Economical Height and minimum material in Bridges of various designs. C. H. Tutton. Chicago. 1878.

On the Improvement of Prairie Roads and Streets. T. J. Nicoll. Chicago. 1878.

From Francis J. Cisneros, Puerto Barrio, U. S. of Colombia ; Report on the Construction of the Antioquia Railroad. F. J. Cisneros. New York. 1878.

Report on the Construction of the Cauca Railway. (U. S. Colombia). F. J. Cisneros. New York. 1878.

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Mayor's inaugural address and reports of Department of the City of Syracuse. 1877-78. Syracuse. 1878.

Report of the Pennsylvania Board of the Pennsylvania, Ohio and West Virginia. Boundary Commission for 1878. Harrisburg. 1879.

From Commissioners of Second Geological Survey of Pennsylvania. W. A. Ingham, Secretary. Philadelphia : Catalogue of the Geological Museum. Chas. E. Hall. Harrisburg. 1878.

Report of Progress in the Beaver River District of the Bituminous coal fields of Western Pennsylvania. I. C. White. Harrisburg, Pa. 1878.

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From J. James R. Croes. New York : An Act incorporating the Newark, N. J. Aqueduct Board. Newark, N. J. 1860. Constitution and By-laws of the Newark, N. J. Aqueduct Board. Newark, N. J. 1860. Reports of the Newark, N. J. Aqueduct Board from 1870 to 1877 inclusive. Some notes on Sewers. J. J. R. Croes. New York. 1879.

From Joseph P. Davis, Boston : Second Annual Report of the Boston Water Board, year ending April 30th, 1878. Boston. 1878.

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Proposal for Superstructure of Lewis' Bridge, over Quinnipiac River, at the crossing of Middletown Avenue, between New Haven and East New Haven, Conn. New Haven, Conn. 1878.
- From Franklin Institute, Philadelphia :
Journal of the Institute for October and November 1878. Philadelphia. 1878.
- From George H. Frost, publisher Engineering News, New York :
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- Description of Boston Water Works. Chicago. 1878.
- Humber's Water Supply for Cities and Towns. Parts 1, 2, 3. Chicago. 1878.
- From Fred. de Funiak, Louisville, Ky. :
Itemized Statement of Car repairs and expenses of Louisville and Nashville and South and North Alabama Railroads, year ending June 30th, 1878. Louisville. 1878.
- From David M. Greene, Troy, N. Y. :
Twenty-third Annual Report of the Water Commissioners of the City of Troy, for the year 1877. Troy. 1878.
- From George S. Greene, Jr., New York :
Annual Report of the Department of Docks, City of New York, 1878. New York. 1878. (4 copies.)
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- From Hartford Steam Boiler Inspection and Insurance Company, Hartford :
Annual Reports for 1877 and 1878.
- From John W. Hill, Cincinnati :
On the Explosion of the Steamer Pat. Cleburne. J. W. Hill. New York. 1878.
- From Gen. A. A. Humphreys, Chief of Engineers, U. S. A., Washington, D. C. :
Statement showing Rank, Duties and address of Officers of the Corps of Engineers. George H. Elliot.
- Annual Report on the Improvement of the South Pass, showing condition of the works, June 30th, 1878. Capt. M. R. Brown. (Copies for distribution.)
- Estimates of amount required for the protection from overflow of the sites of fortifications on the Delaware River, and also an estimate of the cost of repairs at Sandy Hook, New Jersey. William Ludlow.
- Excessive damages awarded in cases arising out of the improvement of Fox and Wisconsin Rivers. Charles Devens. (2 copies.)
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 Twenty-second Annual Report of Board of Trustees of Cleveland Water Works Cleveland. 1878.

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 Sixth Annual Report of the Board of Water Commissioners, city of Yonkers. Yonkers, N. Y. 1879. (Copies for distribution.)

From other Sources ;
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Hevner's New Elevated transmission Line or System of transportation. New York, 1878.
 List of serial publications now taken in the principal libraries of Boston and Cambridge. Cambridge, Mass. 1878.
 Official Catalogue of the Main Building and Art Gallery. Permanent Exhibition. 1877. Philadelphia. 1877.

ANNOUNCEMENTS.

Members who desire to secure complete sets of the Transactions of the Society are requested to send to the Secretary a list of the papers which are needed to fill their sets. Some of the earlier papers are out of print. If orders are received for a sufficient number to warrant the expense, a reprint will be made.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, That Members be requested, in papers hereafter presented to the Society, to

write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

THE HOUSE OF THE SOCIETY is at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

THE Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

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SMITH, HAMILTON, JR....Civil and Mining Engineer, San Fran- cisco, Cal.....	" "

Date of Election.

SWEET, ELNATHAN, JR. . . . Div. Engineer New York State Canals,
Albany, N. Y. Nov. 6th, 1878

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AMERICAN SOCIETY

OF

CIVIL ENGINEERS.

(INSTITUTED 1852.)

VOL. V

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1879.

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—Second Session, June 17th.—"The Electric Light," by C. F. BRUSH, read; "Design and Construction Table for Egg-shaped Sewers," by C. G. FORCE, JR., read; "Graphic Railway Accounts," by CHARLES LATIMER, presented; "The Construction of the Ocean Pier at Coney Island," by CHARLES McDONALD, read and discussed by C. SHALER SMITH, J. WHITELAW, G. W. DRESSER, C. B. BRUSH; "Specifications for Glasgow Steel Bridge," by W. SOOY SMITH, read and discussed by W. H. PAINE, G. BOUSCAREN, A. GOTTLIEB, W. KENT, CHARLES McDONALD, W. METCALF, C. G. FORCE, JR., F. COLLINGWOOD, 45.
 —Third Session, June 18th.—Order as to discussions and limit of time; "Flexure and Transverse Resistance of Beams," by CHARLES E. EMERY, read and discussed by W. KENT; "Progress of Work on New York and Brooklyn Bridge," by F. COLLINGWOOD, read; "Theoretical Resistance of Railway Trains," discussed by J. F. FLAGG, S. WHINERY, W. H. SEARLES, 45; "The Construction and Maintenance of Roads," discussed by C. B. BRUSH, C. SHALER SMITH, G. BOUSCAREN, E. B. VAN WINKLE, F. LAVOINNE, F. RINECKER, CHARLES DOUGLASS FOX, 46.
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 —Fifth Session, June 19th.—"The Construction and Maintenance of Roads," discussed by D. E. McCOMB, E. R. ANDREWS, C. SHALER SMITH, G. BOUSCAREN, G. D. ANLEY, E. S. CHESBROUGH, A. B. HILL, J. E. HILGARD, H. FLAD, M. MERRIWETHER, B. F. MORSE, EDWARD P. NORTH; "Permanent Way of Railways in Great Britain and Ireland, with special reference to the use of Timber, preserved and unpreserved," by JOHN BOGART, discussed by E. R. ANDREWS, C. LATIMER, E. SWEET, JR., W. WATSON, T. EGLESTON, CHARLES PAINE, JOHN KENNEDY, E. W. BOWDITCH; appointment of Committee on Preservation of Timber recommended; "Brick Arches for Large Sewers," discussed by C.

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- February 5th, 1879, Proposals considered; financial business transacted, 15.
- March 6th, 1879, Proposals considered; appropriations made, 15.
- April 2d, 1879, Proposals considered; financial business transacted; action taken as to publications, 15.
- April 30th, 1879, Proposals considered; action taken as to arrears of dues; resolution adopted as to publications; appropriations made, 15.
- May 31st, 1879, Proposals considered; arrangements for convention made; appropriations made, 32.
- June 30th, 1879, Proposals consid-

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- August 4th, 1879, Proposals considered, 74.
- September 2d, 1879, Proposals considered; censors to award Norman Medal appointed; resolutions as to appointment of committees ordered to letter ballot; financial business transacted, 74.
- October 1st, 1879, Proposals considered; action taken as to exchange of publications; as to publications not credited; annual report considered; report of Nominating Committee received and ballot ordered prepared; appropriations made, 74.
- October 31st, 1879, Proposals considered; annual report perfected, 106.
- November 11th, 1879, Standing Committees on Finance and Library appointed; proposals considered; issue of circular ordered; action taken as to members in arrears, 106.
- December 5th, 1879, Proposals considered; issue of circular ordered; appropriations made, 106.

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- January 3d, 1879, Death of SAMUEL J. REEVES, M. A. S. C. E., announced and committee appointed to prepare memoir; result of ballot for amendments to Constitution and By-Laws; address by W. MILNOR ROBERTS, President A. S. C. E., and resolutions adopted on his departure for Brazil, 1.
- January 15th, 1879, "Experiments on the Resistances of Rolling Stock," by A. M. WELLINGTON, read and discussed, 3.
- February 5th, 1879, Result of ballot to determine place of Eleventh Annual Convention; Cleveland to be the place; ballots for membership canvassed; "Engineering Questions Involved in the Development of Electric Lighting," by STEPHEN CHESTER, read and discussed, 3.
- February 19th, 1879, "Notes on Gelatine Dynamite," by JULIUS H. STRIEDINGER, read and discussed, 4.

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- March 5th, 1879, Death of ROBERT G. HATFIELD, M. A. S. C. E., announced, and committee appointed to prepare Memoir; ballots for membership canvassed; "Incline Planes Crossing the Allegheny Mountains," by MONCURE ROBINSON, read and discussed; "High Explosives," discussed, 4.
- March 19th, 1879, "Parabolic Arches for Masonry," by W. A. G. EMOYTS, read and discussed, 5.
- April 2d, 1879, Death of ALFRED W. CRAVEN, Past President A. S. C. E., announced and committee appointed to prepare Memoir; "Minot's Ledge Lighthouse," by B. S. ALEXANDER, read and discussed; a discussion by J. G. BARNARD, upon "The Fall of the Western Arched Approach to South Street Bridge, Philadelphia," read and discussed; reporting abstracts of papers considered; suggestions for consideration at Convention presented, 5.
- April 16th, 1879, "The Construction and Maintenance of Roads," by EDWARD P. NORTH, read, 13.
- May 7th, 1879, Ballots for membership canvassed; suggestions for consideration at Convention, adopted, 13.
- May 21st, 1879, "The Loss of Water in Flowing in Open Earth Channels," by J. JAMES R. CROES, read and discussed, 21.
- June 4th, 1879, Ballots for membership canvassed; action taken as to tests of turbines at Holyoke; "Proposed Connected Girder," by CHARLES E. EMERY, presented and discussed, 29.
- June 18th, 1879, Business meeting at convention; Committee on Uniform Accounts and Returns of Railroad Corporations reported and was discharged; Committee on Tests of American Iron, Steel and other Metals reported, and was continued; Standing Committee on Finance reported; Committee on Exhibit at Paris reported; resolution as to preservation of timber referred; resolution as to uniform system for tests of cement referred; resolution as to holding meeting in various cities, in addition to the convention, lost; resolution as to issue of advance copies of papers

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- July 16th, 1879, "The Flow of Water in Rivers," by DE VOLSON WOOD, read and discussed, 52.
- August 6th, 1879, Ballots for membership canvassed; death of FRANKLIN A. STRATTON, M. A. S. C. E., announced and committee appointed to prepare Memoir; "The South Pass Jetties," by MAX E. SCHMIDT, read and discussed, 59.
- September 3d, 1879, Ballots for membership canvassed; "The Stability of Stone Structures," by WILLIAM H. SEARLES, read and discussed, 65.
- September 17th, 1879, "The Use of Steel for Bridges," by THEODORE COOPER, read and discussed, 65.
- October 1st, 1879, Ballots for membership canvassed; ballots on resolution for appointment of Committee on Preservation of Timber and of Committee on a Uniform System for Tests of Cement, canvassed, and both adopted; death of WARREN COLBURN, M. A. S. C. E., announced and committee appointed to prepare Memoir; proposed amendment to the Constitution submitted; discussion on "Construction and Maintenance of Roads," continued; "The Construction of the Atchison, Topeka and Santa Fé Railroad over the Raton Mountains," by JAMES D. BURR, read and discussed, 73.
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American Society of Civil Engineers.

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[Up to April 2d, 1879.]

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(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 3d, 1879.—The Society met at 8 p. m., the President, W. Milnor Roberts, in the chair.

The death of Samuel J. Reeves, Member A. S. C. E., was announced, and the President was authorized to appoint a committee to prepare a memoir.

The result of the canvass of the ballots for proposed Amendments to the Constitution and By-Laws, was as follows :

Upon the Codification of the Constitution and By-Laws, as printed in Proceedings, Vol. IV., page 95 (July, 1878), there were 74 Ayes and 9 Nays. This codification was thereupon declared adopted.

Upon the Amendment (marked K) to Article XVIII. of the Constitution, as printed in Proceedings, Vol. IV., page 106, there were 81 Ayes and 5 Nays. This amendment was thereupon declared adopted.

Upon the Amendment (marked L) to Article XVII. of the Constitution, as printed in Proceedings, Vol. IV., page 107, there were 78 Ayes and 7 Nays. This amendment was thereupon declared adopted.

Upon the Amendment (marked N) to Article XXIII. of the Constitution, as printed in Proceedings, Vol. IV., page 108, there were 64 Ayes and 21 Nays. This amendment was thereupon declared adopted.

Upon the Amendment (marked O) to article XXXII. of the Constitution, as printed in Proceedings, Vol. IV., page 108, there were 79 Ayes and 7 Nays. This amendment was thereupon declared adopted.

Upon the Amendment (marked P), a new Article of the Constitution, as printed in Proceedings, Vol. IV., page 108, there were 71 Ayes and 15 Nays. This amendment was thereupon declared adopted.

Upon the Amendment (marked R) to Section 1 of the By-Laws, as printed in Proceedings, Vol. IV., page 108, there were 80 Ayes and 5 Nays. This amendment was thereupon declared adopted.

Upon the Amendment (marked S) to Section 23 of the By-Laws, as printed in Proceedings, Vol. IV., page 109, there were 80 Ayes and 6 Nays. This amendment was thereupon declared adopted.

Upon the other proposed Amendments to the Constitution and By-Laws, as printed in Proceedings, Vol. IV., pages 105, 106, 107 and 109, the vote was as follows:

Upon proposed Amendment to Article V. of the Constitution (marked B.) 5 Ayes, 81 Nays.

Upon proposed Amendment to Article V. of Constitution (marked C.), 0 Ayes, 85 Nays.

Upon proposed Amendment to Article V. of Constitution (marked D.), 4 Ayes, 82 Nays.

Upon proposed Amendment to Article VI. of Constitution (marked E.), 5 Ayes, 81 Nays.

Upon proposed Amendment to Article VI. of Constitution (marked F.), 4 Ayes, 82 Nays.

Upon proposed Amendment to Article VI. of Constitution (marked G.), 1 Aye, 84 Nays.

Upon proposed Amendment to Article VII. of Constitution (marked H.), 3 Ayes, 82 Nays.

Upon proposed Amendment to Article IX. of Constitution (marked I.), 9 Ayes, 76 Nays.

Upon proposed Amendment to Article X. of Constitution (marked J.), 12 Ayes, 75 Nays.

Upon proposed Amendment to Article XIX. of Constitution (marked M.), 11 Ayes, 74 Nays.

Upon proposed Amendment to Section 24 of By-Laws (marked T.), 16 Ayes, 69 Nays.

Whereupon these proposed amendments (B, C, D, E, F, G, H, I, J, M, and T), were declared not adopted.

An address was then made by the President, alluding to his approaching visit to Brazil.*

On motion, the chair was taken by Martin Coryell. The following resolution was adopted:

Resolved, That a committee of three be appointed to draw up resolutions in reference to the departure of the President.

Messrs. Charles Macdonald, Mendes Cohen and J. J. R. Croes, were appointed such committee.

The committee presented the following Preamble and Resolution, which were unanimously adopted :

"Whereas, The President of this Society, Col. W. Milnor Roberts, has announced his intention of withdrawing from the active administration of the duties of his position, in consequence of having entered upon a service of great honor and trust under the Government of Brazil, be it,

"Resolved, That we desire to place on record at this time, our sense of Col. Roberts' services to the profession during his long career as an Engineer.

"Beginning at the age of sixteen on the Union Canal of Pennsylvania, he was intimately associated with the development of the most prominent canals of the country.

"He became identified with the railway system at its first inception, and his name has been connected with many of the important railways of the United States; notably with the Allegheny Portage, the Harrisburgh and Lancaster, now part of the main line of the Pennsylvania Railroad, the Bellefontaine and Indians, the Iron Mountain of Missouri, several railroads in Iowa, and the great Northern Pacific Railroad, of which he still remains Chief Engineer.

"His abilities as a Hydraulic Engineer have been recognized in his appointment by the Government to the charge of the Ohio River Improvement, and as one of the Commissioners to advise in regard to the regulation of the mouths of the Mississippi River, in the execution of which duty he visited Europe with the Commission, and examined the principal works of river improvement there.

"He has also been engaged as Consulting Engineer upon many important questions pertaining to the water supply of several of our principal cities.

"During his long connection with the direction of the Society, Col. Roberts' active interest in its affairs has been of great advantage, and his wise counsel has materially aided his colleagues in the settlement of many difficult questions, and the furtherance of the objects of the association.

"While his absence will be seriously felt by them, they are reconciled thereto by the conviction that it will inure to the benefit not only of himself and the enlightened government which has employed him, but of the profession of which he is an honored member."

The President resumed the chair. The reading of the paper announced for this evening was postponed until the next meeting.

JANUARY 15TH, 1879.—The Society met at 8 P. M., Charles Macdonald in the chair.

A paper presented at the Annual Meeting with the report of the Committee on Resistances of Trains, being a report of experiments upon the resistances of rolling stock, made by A. M. Wellington, under the direction of Charles Paine, was read and discussed.

FEBRUARY 5TH, 1879.—The Society met at 8 P. M., William H. Paine in the chair.

* See page 6.

The ballots to determine the place for the Eleventh Annual Convention were canvassed, and the result announced, as follows:

For St. Louis.....	73 votes
For Cleveland.....	82 "
For San Francisco.....	1 "

In accordance with this vote it was determined that the Eleventh Annual Convention should be held at Cleveland.

The ballots for membership were canvassed and the following candidates were declared elected as members: William H. Bradley, of Boston, Mass., and Hamilton Smith, jr., of San Francisco, Cal.

A paper entitled "Engineering Questions Involved in the Development of Electric Lighting," by Stephen Chester, was read by the author, and discussed by Messrs. Chester, Dresser, Haswell, Morison, Searles and Yardley.

FEBRUARY 19TH, 1879.—The Society met at 8 p. m., Past-President William J. McAlpine in the chair.

A paper by Julius H. Striedinger, entitled "Notes on Gelatine Dynamite," was read, and discussed by Messrs. Chanute, Cooper, Emery, Geo. S. Greene, jr., Haswell, Wm. J. McAlpine and Yardley.

MARCH 5TH, 1879.—The Society met at 8 p. m., Ashbel Welch in the chair.

The death of Robert G. Hatfield, member American Society Civil Engineers, was announced, and William E. Worthen, James O. Morse and John Bogart were appointed a committee to prepare a memoir of Mr. Hatfield.

The appointment of John Griffen and Alfred P. Boller was announced, as a committee to prepare a memoir of the late Samuel J. Reeves.

The ballot for membership was canvassed, and the following candidates declared elected:—As Members: James E. Bell, of Cincinnati, O., Thomas Egleston, of New York, Montgomery Meigs, of Washington, D. C., and Joseph O. Osgood (elected Junior May 3d, 1876), of Cañon City, Col.

As Associate: Alexander Gordon, of Cincinnati, O.

As Junior: James P. Allen, of Charleston, S. C.

A communication from Moncure Robinson, and a report made by him in the year 1829 embracing the original recommendation for the plan of crossing the Allegheny Mountains by inclined planes, were read, and discussed by Messrs. Compton, Emery, Haswell, North, Searles and Welch.

Additional experiments with dynamite were described by Charles H. Haswell, and the subject of high explosives was discussed by Messrs. North and Striedinger.

MARCH 19TH, 1879.—The Society met at 8 P. M., Past President George S. Greene in the chair.

A paper by W. A. G. Emonts, entitled "Parabolic Arches for Masonry," was read and discussed.

An informal discussion followed upon the general policy of the Society.

APRIL 2D, 1879.—The Society met at 8 P. M., Past President George S. Greene in the chair.

The death of Alfred W. Craven, Past President American Society of Civil Engineers, was announced, and the following committee was appointed to prepare a memoir of Mr. Craven: George S. Greene, William E. Worthen, Julius W. Adams and Allan Campbell.

Gen. J. G. Barnard, then read a paper on the construction of the Minot's Ledge Light House, including with it a memoir on the subject by the late Gen. B. S. Alexander.

Gen. J. G. Barnard also presented an account of the settlement of Fort Livingston, Fla., and referred to the probable cause of settlement of Pier 2 of South Street Bridge, Philadelphia.

George W. Dresser gave an account of the foundations of a large hospital in New York City.

Francis Collingwood gave an account of the method of providing for special cases in the foundations of the piers of the New York and Brooklyn Bridge.

The following resolution was offered by Theodore Cooper:

Resolved, That an invitation be extended to the editors of Engineering journals to attend our meetings; and that all reasonable facilities be given them to report such abstracts of the papers and discussions as they may desire to publish.

The question was discussed by Messrs. Chanute, Cooper, Croes, Dresser, G. S. Greene, G. S. Greene, Jr., and Macdonald.

The following rule, adopted by the Board of Direction, was read for the information of the Society :

"That business proceedings are not to be reported for the public press. Notices of meetings held, and of the papers read and discussion thereon, may be reported. Abstracts, giving the general tenor of the papers, &c., may be published in advance of the issue of 'Transactions' if approved by the Secretary."

The resolution offered by Mr. Cooper was then withdrawn by him, and on motion of Mr. O. Chanute, it was referred to the Board of Direction.

Mr. Chanute gave notice that at the next meeting of the Society he would offer the following preamble and resolution :

Whereas, Every possible effort should be made to increase the sphere of usefulness of the Society and to enlarge its membership as well as to promote active intercourse between all its members, therefore, be it

Resolved, That the following suggestions and such others as may be submitted, be printed and distributed among the members, with the request that they shall favor the Secretary as soon as possible with their opinions, as well as with such other suggestions as they may wish to offer, so that action upon the same may be taken at the next convention.

SUGGESTIONS.

1st. That provision be made for the holding of more than a single convention in each year for professional intercourse.

2d. That papers be annually invited from members upon subjects of general interest, to be specified by the Board of Direction.

3d. That a system be established to award special recognition for the best papers contributed each year.

4th. That present members be encouraged to propose worthy persons for new members, associates and fellows.

5th. That to promote the discussion of papers, advance copies be issued to such members as may be specially qualified to take part in the same.

6th. That members be encouraged to make use of the facilities of the Society in New York, for obtaining professional information.

NOTES AND MEMORANDA.

REPORTS OF MEETINGS.

Address made by President W. MILNOR ROBERTS, at the meeting of the Society, January 3, 1879.*

The members present are already aware that I have accepted a position as engineer in the service of the Brazilian Government; an appointment unsolicited on my part, and made without my knowledge, upon the nomination of our fellow member, Capt. Eads, to whom the Emperor, Dom Pedro the Second, had addressed an autograph letter, requesting him to nominate an experienced engineer to take the direction of the Improvement of the San Francisco River. At the suggestion of Mr. Borges, the Brazilian Minister, the appointment was afterwards made more general, requiring me to act as engineer upon any of the public improvements the Government might desire. The engagement is for three years from the beginning of January of this year, 1879.

But two months have passed since the members of the Society did me the honor to elect me their President for the present year, and it would have been a great gratification to me to have continued to preside in that honorable position during the entire year. Last year our worthy President, E. S. Chebrough, of Chicago, being prevented by his professional engagements from attendance at the Society's rooms in this city, devolved most of the duties upon myself as Senior Vice-President, during most of the season. Now it falls to my lot, in consequence of my new engagement, to ask the Senior Vice-President to fulfill the duties which properly belong to the President, and, doubtless, he will do them well.

Those who are familiar with the working of the Board of Direction (and Trustees) of the Society are aware that by far the greater part of the labor naturally and necessarily devolves

* See Minutes, p. 3.

upon the Secretary and the Treasurer, under the instructions and supervision, it is true, of the Board of Direction. To the faithful and intelligent action of these officers much of the past success and present prosperity of the Society are due, and I am quite sure that the same solicitude for the best interests of our members, as a body, will be maintained hereafter by those gentlemen.

The field upon which I am about to engage in South America, though upon the same hemisphere, can only be conveniently approached from the United States by water, and over five thousand miles of ocean intervene between New York and Rio Janeiro, the capital city of Brazil, requiring about twenty days' steaming, or twenty-two days, including the usual stops at St. Thomas, Para, Pernambuco and Bahia. Besides this direct monthly steamship communication, there is regular steam communication between the two countries via England, France, Germany, etc., while much of the commerce between the United States and Brazil is still carried by sailing vessels.

This is not my first visit to Brazil; I spent seven years in that country—between 1858 and 1865—as senior partner of the company who built the 2d section of the “Dom Pedro Segunda Railway,” at the time deemed to be one of the most difficult works ever projected. Greater works have since been conducted in Europe and on the west coast of South America, but the undertaking of the Brazilian railroads, nearly a quarter of a century ago, exhibited great foresight as well as most liberal enterprise on the part of the Government. With an enlightened and energetic Emperor, devoted to the maintenance of an admirable written Constitution, and ably sup-

ported by a Parliament and Council composed of educated gentlemen, the future of Brazil should be very great. In 1865, before leaving that country, I had the honor to take part in calling public attention to the importance of a direct steamship line between Brazil and the United States, which was soon after established, sustained in part by subsidies from both governments. After running some years that line was withdrawn. Recently another line has been put on, and it is to be hoped that the Government and people of the United States will encourage more frequent intercourse between the two countries, to their mutual advantage.

Being so far away, I shall miss the professional and social gatherings of our members, and for a time I will have to content myself with the reading of the published Transactions and Proceedings. I trust, however, that they will lose none of their interest in consequence of the distance they must traverse. Though absent in body, I will be present with you in spirit; and, should there be time and opportunity, I may be able to contribute an occasional paper relating to South America, which may have interest for members in North America.

Ours is the “American” Society of Civil Engineers. It knows no “North,” no “South,” save as amicable, continental designations.

I cannot but feel sad at parting for several years with so many associates and personal friends who have been so uniformly kind, but soon this feeling will give place to pleasurable recollections, which I shall carry with me wherever I go.

I bid you one and all an affectionate adieu. May God bless you all.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Architecture. Town and country mansions and suburban houses, with notes on the sanitary and artistic construction of houses. W. Young, New York. Fol. 30 plates. *Spons.* \$12.50.

Army Sacrifices; or, Briefs from Official Pigeon-Holes. Sketches based on Official Reports, grouped together for the purpose of illustrating the services and experiences of the Regular Army of the United States on the Indian Frontier. Maj.-Gen. Jas. B. Fry, U. S. A. New York. 16mo. *Van Nostrand.* \$1.00.

Canal and Culvert Tables, based on the formula of Kutter, under a modified classification. With explanatory text and examples. Louis D'A. Jackson. London. 8vo. *W. H. Allen.* 28s.

Cast Iron Pipes. Ernest Benedict. New York. 8vo. *Spons.* \$0.20.

Catalogue, The American—of books in print and for sale on July 1, 1876. Vol. 1. Authors and Titles. Parts 1 and 2. A. to Lennox. By F. Leyboldt and L. E. Jones. New York. Quarto. *Leyboldt.* For the two volumes complete, \$25.00.

- Coal.** The History of —; lecture at King's College. T. Wiltshire. London and New York. 8vo. *Spons.* \$0.40.
- Corals and Coral Islands.** Maps and illus. James G. Dana. New York. *Dodd, Mead & Co.* \$3.50.
- Dampness.** Traité complet sur l'humidité qui se fait sentir dans la plupart des habitations. P. Vienot. Paris. 8vo. New York. *Van Nostrand.* \$1.00.
- Education as a Science.** Alexander Bain. London. 8vo. *C. K. Paul & Co.* 5s.
- Electric Light.** Farmer on the Electric Light; extracts from "The Speaking Telephone, Electric Light, and other recent electrical inventions." G. S. Prescott. Newport, R. I. 8vo. *C. E. Hammett.* \$0.15.
- Electric lighting.** Useful information on practical electric lighting. Killingsworth Hedges. New York. 8vo. *Spons.* \$0.40.
- Engineers', Architects' and Contractors' Pocket Book for 1879.** London. 12mo, bound. *Crosby Lockwood.* 6s.
- Fuel: Its Combustion and Economy.** Consisting of Abridgements of a Treatise on the Combustion of Coal and the Prevention of Smoke, by C. W. Williams, and the Economy of Fuel, by T. Symes Prideaux. With extensive Additions on Recent Practice in the Combustion and Economy of Fuel, Coal, Coke, Wood, Peat, Petroleum, &c., by the Editor, D. Kinear Clark. (Weale's Series.) London. 12mo. *Crosby Lockwood.* 4s. 6d.
- Health, and How to Promote it.** By Richard McSherry, M. D., President of the Baltimore Academy of Medicine. 12mo. New York. *Appleton.* \$1.25.
- , The Public. Suggestions as to the Preparation of District Maps and plans for Main Sewerage, Drainage and Water Supply. With 18 Plans. Roy. 8vo. R. Rawlinson. London. *British Government Publication.* 3s.
- Illuminating: A Practical Treatise on the Art.** By Marcus Ward, illuminator to the Queen. With 26 Examples of the Styles prevailing at the different Periods, from the Sixth Century to the Present Time; chromographed in facsimile and in outline. Fcap. 4to. London. *Marcus Ward & Co.* 5s.
- Lithography: Grammar of Lithography.** A Practical Guide for the Artist and Printer in Commercial and Artistic Lithography, Zincography, Photolithography and Lithographic Machine Printing. Edited and revised, with an Introduction, by the Editor of "The Printing Press and Lithographer." Post 8vo. W. D. Richmond. London. *Wyman.* 5s.
- Map Drawing: The parallel and meridional system.** W. V. Marshall. 4to. New York. *Barnes.* \$0.25.
- Mathematical Problems.** Jos. Wastenhols. 8vo. London. 2d ed. enl. New York. *Macmillan.* \$6.00.
- Mathematical Tables.** James Pryde. New ed. 12mo. Edinburgh. *Chambers.* New York. *Worthington.* \$1.75.
- Municipal Corporations Companion.** Diary, Directory, and Year-Book of Statistics for 1879. 8vo. London. *Waterlow.* 5s.
- Physics.** Practical Physics, Molecular Physics and Sound. (London Science Class Book.) F. Guthrie. 18mo. London. *Longman's.* 1s. 6d.
- Physical Forces, new and original theories.** H. Raymond Rogers. 12mo. Dunkirk, N.Y. *C. K. Abel & Son.* \$0.60.
- Price Book for Builders and Contractors for 1879.** (Weale's Series.) 12mo. London. *Lockwood.* 3s. 6d.
- Science Text Books.** 16mo, fully illustrated. New York. *Appleton:*
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 17. The Study of Rocks: an Elementary Text-Book of Petrology. By Frank Rutley, F. G. S., of H. M. Geological Survey. \$1.75.
- Steam Engine, Text-Book on the — — —.** T. M. Goodeve. 12mo, illus. New York. *Van Nostrand.* \$2.50.
- Strength of Materials.** Wm. Kent. (Science Series No. 41.) 16mo. New York. *Van Nostrand.* \$0.50.
- Telegraphy.** Book for beginners. F. S. Beechey. 8vo. London and New York. *Spons.* \$0.60.
- Turbine Wheels.** On the inapplicability of the Theoretical Investigation of the Turbine Wheel as given by Rankine, Weibach, Bresse and others, to the Modern Constructions introduced by Boyden and Francis. By Prof. W. P. Trowbridge. 18mo, illustrated. (Science Series No. 44.) New York, *Van Nostrand.* \$0.50.
- Warming Buildings.** Practical treatise on warming buildings by hot water, steam and hot air ventilation, and the various methods of distributing artificial heat, and their

effects on animal and vegetable physiology; [also] an inquiry into the laws of radiant and conducted heat, chemical constitution of coal, and combustion of smoke. C. Hood. 5th ed., enl. 8vo, illus. New York. *Spence*. \$4.25.
Woods, Native and Foreign. Les Bois Indigènes et Etrangers : Leur Physiologie, Cul-

ture, Production, Qualités, Defauts, Statistique, etc. Par Alph. E. Dupont, Ingenieur des Constructions Navales, et Bouquet de la Grye, Conservateur des Forêts. Un Volume in 8°, orné de 162 Gravures. Prix. 12fr.
Year book of facts in Science and the Arts for 1878. J. Mason. 8vo. London. *Ward & Lock*. 2s. 6d.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Administration des Ponts et Chaussées, Paris :
Annales, January, 1879.

From American Institute of Mining Engineers, Thomas M. Drown, Secretary, Easton, Pa. :

Transactions, Vol. VI. May 1877, to February, 1878.

From Geo. D. Ansley, City Surveyor, Montreal, Canada :
Report of the City Surveyor of Montreal, for 1878.

From Argentine Scientific Society, Don Felix Amoretti, Secretary, Buenos Ayres :
Annals of the Society. December, 1878. January, 1879.

From Austrian Society of Engineers and Architects, Vienna, Austria ;
Zeitschrift. Dr. Wilhelm Finter, Redaktor. Part XII. 1878. Part I. 1879.

From Board of Water Commissioners, Buffalo, N. Y. :
Tenth Annual Report of Buffalo City Water Works. Buffalo. 1879.

From Robert Briggs, Philadelphia :
Machines for making Ice, using Sulphurous Acid or Ammonia in the process. Robert Briggs. Philadelphia. 1870.

From W. E. C. Coxe, Philadelphia :
Report of the President and Managers of the Philadelphia and Reading Railroad Co. Philadelphia. 1879.

From J. James R. Croes, New York :
Annual Report of the Newark, N. J., Aqueduct Board, for the year ending November 30th, 1878. Newark. 1878.

One Photograph " **Matrass Revetment**," on the upper Missouri River in 1878, in charge of S. H. Yonge, Asst. U. S. Civil Engineer.

From Joseph P. Davis, City Engineer, Boston :
Annual Report of the City Engineer of Boston, for 1878.

From Fred. de Funiak, Louisville, Ky. :
Annual Report of the Louisville and Nashville Railroad Co. June 30th, 1878.

Cost of road repairs for six months, ending December 31, 1878. Lou. and Nash., and South and North Ala. Railroads.

Itemized statement of car repairs, and expenses for six months, ending December

31, 1878. Lou. and Nash. and South and North Ala. Railroads.

From Franklin Institute, Philadelphia :
Journal of the Institute for January and February, 1879. Philadelphia. 1879.

From F. U. Farquhar, Rock Island, Ill. :
Annual Report of the Railroad Commissioners of Minnesota, for 1875. J. J. Randall. St. Paul. 1876.

Second Annual Report of the Geological and Natural History Survey of Minnesota. St. Paul. 1874.

Report of the Canal Commissioners of Minnesota, for 1875. St. Paul. 1876.

Second Annual Report of the State Fish Commissioners of Minnesota. St. Paul. 1876.
Statistics of Minnesota, for 1871, 1872, 1873 and 1874.

Annual Report of the Board of Regents of the University of Minnesota. 1872 and 1874. First, Second, Fourth, Fifth, Sixth and Seventh Annual Reports of the St. Paul, Minn., Chamber of Commerce.

Peat for Domestic Fuel. S. F. Peckham. Minneapolis. 1874.

From Hon. A. A. Haggett, Lowell, Mass. :

Sixth Annual Report of the Lowell Water Board. Lowell. 1879.

From Hon. Abram S. Hewitt, New York ;
Our National Inheritance, and how to enjoy it. Abraham S. Hewitt. Washington. 1879. (Copies for distribution.)

From General A. A. Humphreys, Chief of Engineers, U. S. A., Washington, D. C. :

Cost of Lake Survey. Gen. C. B. Comstock. (2 copies.)

Estimates for continuing the improvement of the White and St. Francis Rivers, the l'Anquilla River, and the Buffalo Shoals in White River. Maj. W. H. H. Benyaurd. (2 copies.)

Information in relation to the progress and present status of the work on the canal and locks at the Cascades of the Columbia River. Maj. G. L. Gillespie. (2 copies.)

Information of the result of the survey of Portage Lake, Michigan. Col. S. M. Mansfield. (2 copies.)

Information in relation to the improvement of the sanitary condition of Washington, and deepening the river channel. S. Thayer Abert. (2 copies.)

- Information as to the results of examination of Wolf River, from Lake Paygan to Red River, Wisconsin. Col. D. C. Houston. (2 copies.)
- A report upon the examination of Apalachicola River and Bay. Capt. A. N. Damrell. (2 copies.)
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- Report upon the harbor at the Delaware Breakwater. Gen. A. A. Humphreys. (2 copies.)
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- Report in relation to the amount of appropriation necessary to complete the breakwater and piers at the harbor of Michigan City, Ind. Maj. J. A. Smith. (2 copies.)
- Preliminary Report on the survey of the Missouri River, from its mouth to Sioux City, Iowa. Maj. C. R. Suter. (2 copies.)
- Report upon survey of Missouri River at Saint Charles, Mo. Maj. C. R. Suter. (2 copies.)
- Report of surveys of North Landing River, Onancock Harbor and Nottaway River, Va., and Pedee, Trent, Nense, Chowan and Tar Rivers in North Carolina. Capt. C. B. Philips. (2 copies.)
- A Report upon the examination of the flats of the Potomac River. Col. T. Lincoln Casey. (2 copies.)
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- Results of an examination made of the Missouri River at and near its junction with the Kansas River, and the estimated cost of its improvement. Maj. C. R. Suter. (2 copies.)
- The Work upon Hoard's Rocks, Monongahela River. Col. Wm. E. Merrill. (2 copies.)
- From Institution of Civil Engineers, publications edited by James Forrest, Secretary, London, as follows :
- Abstracts of Papers in Foreign Transactions and Periodicals. Vol. LV. Session 1878-9. Part I.
- Engineering Progress in Foreign Countries. Vernon-Harcourt, Clark, Bauerman and Higgs.
- Harbor and Dock Works;
- (1.) The Avonmouth Dock. 'J. Mackenzie.
 - (2.) The River Lagan and Harbor of Belfast. Thomas R. Sulmond.
- (3.) Whitehaven Harbor. John. E. Williams.
- On the Heating and Ventilating Apparatus of the Glasgow University. W. W. Phipson.
- From the Institution of Mechanical Engineers, Walter R. Browne, Secretary, London :
- Proceedings of the Institute, July 28th and 29th, 1868.
- From Wm. Ripley Nichols, Boston : Chemical Examinations of Sewer Air. Prof. Wm. Ripley Nichols, Boston. 1879.
- From Edward P. North. New York :
- Official Catalogue of the United States Exhibitors at the Paris Universal Exposition. London, 1878.
- From the North of England Institute of Mining and Mechanical Engineers, Theo. Wood Bunning, Secretary, Newcastle-on-Tyne, England :
- Transactions of the Institute, December, 1878
- From Ernest Pontzen, Paris :
- Maison Spéciale pour l'application de la pression Hydraulique a toute industrie. H. Thomasset. Paris, 1878.
- From W. N. Radenhurst, Rochester, N. Y. :
- Report of State Engineer for 1878. Horatio Seymour, Jr. Albany, 1879.
- From John Reid, Paterson, N. J. :
- Two Photographs, Iron Work Construction, Seventh Regiment Armory, New York City. C. W. Clinton, Architect.
- From the Publishers, Revue Général des Chemins de fer. Edgar Moujcan, Secretary, Paris :
- Revue Général des Chemins de fer. December, 1878.
- From William Rotch, Fall River, Mass. :
- Fifth Annual Report of Watuppa Water Board. Fall River. 1879.
- From the Royal United Service Institution, Capt. B. Burgess, Secretary. London :
- Journal of the Institution, No. XCVIII, Vol. XII.
- From John Russell, San Francisco :
- Municipal Reports of San Francisco. 1877-8.
- From Wm. B. Sherman, New Bedford, Mass. :
- Ninth Annual Report of the Acushnet Water Board. New Bedford. 1878.
- From Société des Ingénieurs Civils, Paris :
- Memoires. September and October, 1878.
- From R. H. Thurston, Hoboken, N. J. :
- Address before the American Association for the Advancement of Science, at the meeting held in St. Louis, August, 1878. Prof. R. H. Thurston. Salem, Mass. 1878.
- Friction and its Laws, as determined by recent experiment. Prof. R. H. Thurston. Salem Mass. 1878.
- New determinations of the coefficients of Friction of Lubricated Journals and on the law governing such friction. Prof. R. H. Thurston. Philadelphia. 1878.
- From George E. Waring, Jr., Newport, R. I. ;
- Irrington Sanitary Survey. An examination as to local causes of fever and ague on the

east bank of the Hudson River from Dobb's Ferry to Tarrytown, with recommendations for improvement. Geo. E. Waring, Jr. New York. 1879.

From Joseph M. Wilson, Philadelphia: Notes on the Internal Improvements of Pennsylvania, and Reminiscences of the first railroad over the Allegheny Mountains. W. Hasell Wilson and Solomon W. Roberts. Philadelphia. 1879.

From Wilson Brothers & Co., Philadelphia: Two plates of Bridge over Pennsylvania R. R. at Belmont Avenue, Philadelphia. Two plates of Bridge over Pennsylvania R. R. at Fortieth Street, Philadelphia. Two plates of Bridge over Pennsylvania R. R. at Forty-first Street, Philadelphia. Two plates of Span No. 1 of the Morrisville

Bridge, New York Division, Pennsylvania R.R. Two plates of Suspension Bridge (Ordish's System) over the Pennsylvania R. R., Forty-first Street, Philadelphia. Two plates of Jersey City Station, Pennsylvania R. R. Two plates of Passenger Station, Baltimore and Potomac R. R. Two plates of West Philadelphia Station, Pennsylvania R. R.

From F. Leypoldt, New York: The American Catalogue, Vol. I. Authors and Titles. Part 2. Edwards—Lennox. The Library Journal, Nos. 1 and 2, Vol. IV. The Library Journal, Index to Vol. III, March, 1878, December, 1878. The Title slip Registry, Vol. I, Nos. 1 and 2.

ANNOUNCEMENTS.

THE ELEVENTH ANNUAL CONVENTION of the Society will be held at CLEVELAND, JUNE 17TH, 1879. Announcement as to the details of programme and proceedings will be issued in a short time.

Copies of the Speech made in Congress by Hon. Abram S. Hewitt upon the subject of the Public Lands and their Surveys have been kindly sent to the Society by the author and mailed to the members.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every Thursday evening, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
EGLESTON, THOMAS.....	Professor of Mineralogy and Metallurgy, School of Mines, Columbia College, 35 West Washington Square, New York.....
	March 5th, 1879.

OSGOOD, JOSEPH O. (Elected Junior May 3d, 1876), Division Date of Election.
 Engineer Pueblo and Arkansas Valley
 Railroad, Cañon City, Colorado. March 5th, 1879.

JUNIOR.

ALLEN, JAMES P. Civil Assistant Engineer U. S. Corps of
 Engineers, care of Maj. F. U. Far-
 quhar, Rock Island, Ill. March 5th, 1879.

CHANGES AND CORRECTIONS.

MEMBERS.

AUCHINCLOSS, WILLIAM S. 200 West Logan Square, Philadelphia, Pa.
 CLARKE, THOMAS C. 71 Broadway, Room 72, New York.
 FINK, RUDOLPH. General Manager, Memphis and Little Rock Railroad,
 Little Rock, Ark.
 FLINT, EDWARD A. 11 Tremont Bank Building, Boston, Mass.
 NICHOLS, OTHNIEL F. Box 229, Westerly, Rhode Island.
 ROBERTS, W. MILNOR. Care of O. C. James, Caixa N. 721, Rio de Janeiro,
 Brazil.
 SMITH, HAMILTON, JR. Civil and Mechanical Engineer, Room 24, 320 Sansom
 st., San Francisco, Cal.
 VAN BUREN, JOHN D., JR. 10 West Thirtieth st., New York.

JUNIOR.

STAATS, ROBERT P. 169 West Twelfth st., New York.

DECEASED.

CRAVEN, ALFRED W. President of the Society from Novem-
 ber 3, 1869, to November 1, 1871. March 27th, 1879.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V.—February, 1879.

[Up to May 15th, 1879.]

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 16TH, 1879.—The Society met at 8 P. M. Past President George S. Greene, in the chair.

A paper, entitled "The Construction and Maintenance of Roads," by Edward P. North, was read by the author.

The discussion of the paper was postponed to a future meeting.

MAY 7TH, 1879.—The Society met at 8 P. M. Mr. Charles Macdonald in the chair.

The ballot for membership was canvassed, and the following candidates declared elected :—As Members—Daniel P. Bruner (elected Junior, September 6th, 1876), Harrisburg, Pa.; Thomas G. Dabney, United States Engineer in charge of Harbor Works, Vicksburgh, Miss.; Henry B. Richardson, Assistant State Engineer, Louisiana Board of State Engineers, St. Joseph, La.; Max E. Schmidt, Chief Assistant Engineer South Pass Jetty Works, Port Eads, La. As Associate—Percival Roberts, Jr., Pencoyd Iron Works, Philadelphia, Pa.

On motion of Theodore Cooper, the minutes of the meeting of the Society of April 2d (Vol. V, p. 5, seventh line from bottom), were amended by inserting as follows : "Mr. Cooper withdrew the motion, as he considered the expression of the members during the discussion was sufficiently expressive without bringing the result to a vote; and not being aware of the action of the Board of Direction until after the reso-

lution had been offered, he did not wish to develop by a vote an expression of the opinion of the meeting in opposition to the action of the Board."

The action of the Board of Direction in reference to notices of arrears of dues and as to publication of Proceedings and Transactions was reported. (See Minutes of Board of Direction of April 30th, below.)

The following preamble and resolution were then discussed and passed :

Whereas, Every possible effort should be made to increase the sphere of usefulness of the Society, and to enlarge its membership as well as to promote active intercourse between all its members, therefore, be it

Resolved, That the following suggestions and such others as may be submitted, be printed and distributed among the members, with the request that they shall favor the Secretary as soon as possible with their opinions, as well as with such other suggestions as they may wish to offer, so that action upon the same may be taken at the next convention.

SUGGESTIONS.

1st. That provision be made for the holding, in addition to the annual convention, a number of general meetings in various cities in each year, for professional intercourse.

2d. That papers be annually invited from members or other persons upon subjects of general engineering interest, to be specified by the Board of Direction.

3d. That a system be established to award special recognition for the best papers contributed each year.

4th. That present members be encouraged to propose worthy persons for new members, associates, and fellows.

5th. That to promote the discussion of papers, advance copies be issued to such members or other persons as may be specially qualified to take part in the same, or to members applying for them in order to take part in the discussion.

6th. That members be encouraged to make use of the facilities of the Society in New York for obtaining professional information.

7th. That the Library Committee be requested to report whether some plan may not be adopted to enable members living away from New York to consult the books of the Library, under proper regulations to ensure their return and to prevent injury.

8th. That suggestions be invited from members as to the feasibility of adopting some plan of affiliation with local engineers' clubs in other cities.

9th. That the desirability be discussed of appointing Research Committees, whose duties shall be to collect the results of existing experiments on any subject, and to suggest what further experiments are necessary, and also to collate such professional papers as may have been published elsewhere.

OF THE BOARD OF DIRECTION.

JANUARY 3D, 1879.—Applications for membership were considered. The filing of the annual certificate required by statute was reported by the Secretary. Appropriations were made.

FEBRUARY 5TH, 1879.—Applications for membership were considered, and financial business transacted.

MARCH 6TH, 1879.—Applications for membership were considered. Appropriations were made.

APRIL 2D, 1879.—Applications for membership were considered. Financial business was transacted. A resolution was adopted as to publications of Transactions and Proceedings (printed in Minutes of the Society for April 2d, 1879, Proceedings, Vol. V, page 5).

APRIL 30TH, 1879.—Applications for membership were considered. The Treasurer reported the number of members in arrears for dues, and the amount owing to the Society by its members. The following resolution was passed :

Resolved, That the Secretary be directed to notify all members in arrears that unless the dues for the current Society year, beginning November 6th, 1878, are paid before November 5th, 1879, they will cease to be members.

Also, that members who are in arrears for more than the dues for the current year, be notified that their dues for years previous to the current year are still to be paid, and that payment of the same will be required, unless good reason to the contrary, in compliance with the provisions of Article XXXII, of the Constitution, be assigned before November 5th, 1879.

The resolution referred to the Board at the meeting of the Society of April 2d, and the former action of the Board on the subject of publication of the Transactions and Proceedings, were considered, and the following resolution was adopted :

That business proceedings are not to be reported for the public press. Abstracts of the papers read and discussions thereon, giving the general tenor of the papers, etc., may be published.

Appropriations were made.

 LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Alphabets, Prang's Standard; Designs for titles, colored initials, borders, compass points, topographical signs, the State Arms of the Union, etc. Especially adapted for the use of sign- and alinters, engravers, illuminators, architects and civil engineers. 42 plates, 14 in color. Boston. *Prang & Co.* \$5.00

Art; Illustrations of the History of —. A series of above 2 000 woodcuts, selected, by

permission, from the works of Kugler, Lubke, Burckhardt, Overbeck, Dohme, C. Von Lutzow, Falke, Woltmann, La roix, etc. Chronologically arranged. Authorized American edition, published under the supervision of S. R. Koehler. Boston. *Prang & Co.*

The complete work will consist of the following series :

I. Architecture, Sculpture, and the Indus,

- trial Arts among the Nations of Antiquity. 39 plates. \$1.50.
- II. Architecture and Sculpture of the Early Christian, Romanesque, and Gothic Periods. Architecture and Ornamentation of the Mohamedan Nations. 57 plates. \$2.25.
- III. Architecture and Sculpture of the Renaissance Period and of the Modern Times. 48 plates. \$2.00.
- IV. The Industrial Arts among the Oriental Nations and the Nations of Europe, from the Middle Ages down to Modern Times. 42 plates. \$1.75.
- V. The History of Painting, from the Time of the Egyptians to the Close of the 18th Century. 60 plates. \$2.50.
- Size of plate 17 x 12. Each of these series is complete in itself, and is sold separately.
- Astrolabe; On Champlain's —, lost June 8th, 1613, found August, 1867; considered in solution of an obscurity in his journal of first voyage up the Ottawa; and the great antiquity of astrolabes, and origin of their graduation. 24 p., maps and phot. A. J. Russell, 8vo. Montreal. Dawson Bros. \$0.50.
- Building Construction; Notes on —. Part 3, Materials. 8vo. London. Rivingtons. 21s.
- Buildings for Laboring Classes; the need, and way to meet it on strict commercial principles, in New York and other cities. New York. Putnam. 8vo. \$0.30.
- Canal Reminiscences: recollections of travel in the old days on the James River and Kanawha Canal. G. W. Bagley. Richmond, Va. 12mo. West, Johnson & Co. \$0.20.
- Carpenters' and Builders' Guide. L. D. Gould. Rev. Ed., 8vo illus. New York. Bicknell & Comstock. \$3.00.
- Circle: The System of Calculating Diameter, Circumference, Area, and Squaring the Circle; with tables and information. James Morton. Philadelphia. Claxton, Remsen & Haffelfinger. \$1.00.
- Club Directory: A General Guide or Index to the London and County Clubs, and those of Scotland, Ireland and British Colonial Possessions; together with the English Clubs in Europe, the United States, and elsewhere throughout the world; their Constitution, Amount of Entrance Fee and Subscription. Names of Trustees and Secretaries, together with other useful information; the whole interspersed with amusing and interesting Anecdotes collected with some amount of labor from various sources. G. J. Ivey. London. 8vo. Harrison. 5s.
- Color-sense; its origin and development. Grant Allen. Boston. 8vo. Houghton, Osgood & Co. \$3.50.
- Color, the theory of —, in its relation to Art and Art industry. W. Von Bezold. Trans. by S. R. Koehler. Boston. 12mo, illus. and plates. L. Prang & Co. \$5.00.
- Drainage. Hints on House Drainage, for owners, occupants and builders. H. Ough. 8vo illus. Spots. London. 6d. New York 20cts.
- Draining for profit and draining for health. G. E. Waring, Jr. 12mo, illus., 2d ed., rev. and enl. New York. Grange, Judt & Co. \$1.50.
- Education as a Science. By Alexander Bain, LL.D. Number 26 of "The International Scientific Series," 12mo. New York. Appletons. \$1.75.
- Healthy Houses. Fleming Jenkin. Adapted to American conditions, by G. E. Waring, Jr. New York. Harpers. 25cts.
- Health Primers. No. 5. Personal appearance in health and disease. Sidney Coupland, M.D. No. 6. Baths and Bathing. New York. 16mo. Appletons. Each 40cts.
- Lighthouses and Lightships. A Descriptive and Historical Account of their Mode of Construction and Organization. W. H. D. Adams. Illus. from Photographs, &c. Post. 8vo. London. Nelson & Sons. 3s. 6d.
- Locomotive Engines. A Historical Sketch and Description, by G. D. Dempsey, C.E. With large Additions, treating of the Modern Locomotive, by D. Kinnear Clark, M.I.C.E. Weales Series. London. Crosby Lockwood. 3s. 6d.
- Mechanical Engineering; Tables of principal speeds occurring in mechanical engineering, expressed in metres, in a second, by P. Kierzeff, tr. by Sergius Kern. London, 8vo. Spots. 6d.
- Mechanics' Reference Book; Calverts; Practical and Entertaining Information for Handicraftsmen; Being the whole Series of Calvert's Mechanics' Almanack, from the Commencement, 1874 to 1879, inclusive. Also a Practical Treatise on Decimal Arithmetic, Tables, &c., to which is added a specially compiled List of Technical Books. London. Post. 8vo. J. Heywood. 3s. 6d.
- Pebbles. Alpheus Hyatt (Guides for Science-teaching No. 1). Boston. Ginn & Heath. \$0.15.
- Pennsylvania Railroad in its engineering aspect. Jas. Dredge. New York. 4to. Wiley. \$15.00.
- Railroad Accidents; their causes and prevention. Charles Francis Adams. New York. 12mo. Putnam. (Announcement)
- Railroad Securities. A Treatise on the Law of Railroad and other Corporate Securities, including Municipal Aid Bonds. Leonard A. Jones. Boston. 8vo. Houghton, Osgood & Co. \$6.50.
- Rocks, The Study of Rocks. An Elementary Text-book in Petrology. By Frank Rutyl, of the English Geological Survey. New volume in "Text-Books of Science Series." 16mo, illus. New York. Appletons. \$1.75.
- Road Locomotives. A summary of the Roads Locomotive Acts, 1861, 1865 and 1873, in Force in England and Scotland. Compiled for the Use of Road Locomotive Engine Proprietors and Users. 18mo, pp. 24. Groom (Theftord) Simpkin. London. 6d.
- Road Maintenance; The maintenance of Macadamized roads. Thomas Codrington. Lond n. 8vo. Spots. 6d.
- Rule; Spiral Slide — equivalent to a straight slide rule 83 feet 4 inches long, on a circular rule 13 feet 3 inches in diameter (patent). By G. Fuller. Fcap. 8vo. Spots. New York. \$0.20.
- Sewage Poison; how to avoid it in the cheapest and best way. Ed. T. Blake. London. 8vo. Hardwicke & Bogue, 1s.
- Steam Engine. Marine — — — Robert Murray. (Weale's Series.) New ed. 12mo. Crosby Lockwood. 3s.
- — — Catechism of the Marine Steam Engine, for the use of engineers, firemen, mechanics. By Emory Edwards. Illus. by eng. of most modern engines. 12m. Philadelphia. H. C. Baird. \$2.00.

Trusses and Arches analyzed and discussed by graphical methods. In three parts. Part II: Bridge trusses, single, continuous and draw spans; single and multiple system; straight and inclined chords. C. E. Greene. New York. 16mo. Plates. *Wiley*. \$2.50.
Tunnelling in Heavy Ground, for Railways. C. T. Gupper. London. 8vo. *Spon.* 7s. 6d.

Water; On the quantity and quality of water supplied to London during 1878. Charles M. Tidy. London. 8vo. *Churchill*. 6d.
Water Pipes: The kitchen boiler and water pipes: their arrangement and management, their treatment during frost, and how to avoid explosions. By H. Grimshaw. 8vo. *Spon.* London. 1s. New York. \$0.40.

ANNOUNCEMENTS.

THE ELEVENTH ANNUAL CONVENTION of the Society will be held at Cleveland, beginning Tuesday, June 17th, 1879.

Sessions for the consideration of professional subjects, and one for the transaction of business will be held.

The details of the programme will be announced as soon as determined by the local committee.

The following is a list of topics to be considered with reference to papers published in Transactions during the preceding year:

AMERICAN ENGINEERING AT INTERNATIONAL EXHIBITIONS.

CLXXIV. American Engineering as illustrated at the Paris Exposition of 1878. George S. Morison, Edward P. North and John Bogart.

BRIDGES.

— Discussion of Paper CXL. The Determination of Stresses in the Eye-Bar Head. De Volson Wood. Vol. VII, page 189.

— Discussion of Papers CXLIV and CXLIX. Relative Quantities of Material in Bridges of different kinds, of various heights. William H. Searles. Vol. VII, page 192.

CEMENTS.

— Discussion on Cements. Don J. Whittemore. Vol. VII, page 274.

— Discussion on Cements and Strength of Bricks. F. Collingwood. Vol. VII, page 280.

FOUNDATIONS.

CLXXII. The use of Compressed Air in Tubular Foundations, and its application at South Street Bridge, Philadelphia, Pa. D. McN. Stauffer.

HYDRAULICS.

CLX. On the Cause of the Maximum Velocity of Water flowing in Open Channels being below the Surface. James B. Francis.

CLXI. The Flow of Water in Pipes under Pressure. Charles G. Darrach.

— Discussion on the Cause of the Maximum Velocity of Water flowing in Open Channels being below the Surface, and also on the Flow of Water in Pipes under Pressure. Theo. G. Ellis, C. E. Emery, Clemens Herschel, De Volson Wood and John T. Fanning. Vol. VII., page 122.

CLXVII. Distribution of Rain-fall during the great storm of October 3d and 4th, 1869. James B. Francis.

CLXVIII. The Gauging of Streams Clemens Herschel.

CLXXV. The Flow of Water in Small Channels, after Ganguillet and Kutter, with Kutter's Diagram modified, and Graphical Tables with special reference to Sewer Calculations. R. Hering.

MASONRY.

CLXX. Brick Arches for Large Sewers. R. Hering.

— Discussion on Brick Arches for Large Sewers. E. S. Chesbrough, W. Milnor Roberts, R. Hering and F. Collingwood. Vol. VII., page 258.

CLXXI. Fall of Western Arched Approach to South Street Bridge, Philadelphia, Pa. D. McN. Stauffer.

— Discussion on Nomenclature of Building Stones and Stone Masonry. J. Foster Flagg, J. J. R. Cross, J. P. Davis, F. Collingwood, J. Veazie and E. P. North. Vol. VII., page 284.

METALS.

CLXIII. On a newly discovered relation between the Tenacity of Metals and their resistance to Torsion. Robert H. Thurston.

CLXIV. Observations on the Stresses developed in Metallic Bars by Applied Forces. Theodore Cooper.

PRESERVATION OF TIMBER.

CLXXVI. The Permanent Way of Railways in Great Britain and Ireland, with special reference to the use of Timber, preserved and unpreserved. Compiled from information received from Engineers

in charge of those railways. John Bogart.

RAILROADS.

CLIX. On the Theoretical Resistance of Railroad Curves. S. Whinery.

— Discussion on the Resistance of Railroad Curves. O. Chanute, Chas. E. Emery, E. Yardley, E. P. North, C. L. McAlpine, F. Collingwood and Wm. H. Paine. Vol. VII, page 97.

CLXVI. Reminiscences and Experiences of Early Engineering Operations on Railroads, with especial reference to Steep Inclines. W. Milnor Roberts.

— Discussions on Inclined Planes for Railroads. O. Chanute and William H. Paine. Vol. VII., page 216.

RIVERS AND HARBORS.

CLXII. The South Pass Jetties. Descriptive and Incidental Notes and Memoranda. E. L. Corthell.

— Discussions on the South Pass Jetties. Charles W. Howell, E. L. Corthell, O. Shaler Smith, J. Foster Flagg. Vol. VII, page 159.

CLXIX. The Dangers threatening the Navigation of the Mississippi River and the Reclamation of its Alluvial Lands. B. M. Harrod.

STEAM ENGINES.

CLXV. Cushioning the Reciprocating Parts of Steam Engines. John W. Hill.

— Discussion on Steam Engine Economy. J. Foster Flagg and E. D. Leavitt, Jr. Vol. VII, page 194.

SUBMARINE TELEPHONY.

CLXXIII. Submarine Telephoning. Chas. Ward Raymond.

In addition to the above papers, it is expected that the following subjects will be presented by papers printed previous to the date of the Convention, or read at its meeting:

Engineering Questions involved in the Development of Electric Lighting. Stephen Chester.

Gelatine Dynamite and High Explosives. Julius H. Striedinger.

Lighthouse Construction. J. G. Barnard. Memoir upon the Construction of the Minots Ledge Light. B. S. Alexander.

The Construction and Maintenance of Roads. Edward P. North.

The Resistances of Railway Rolling Stock. A. M. Wellington.

The Railroad Crossing of the Allegheny Mountain. Moncure Robinson.

Notes on Early Railroad Engineering. Ashbel Welch.

Remarks on the Causes of Fall of the Western Arched Approach to South Street Bridge, Philadelphia, Pa. J. G. Barnard. Parabolic Arches in Masonry. W. A. G. Emonts.

Notes on the Foundations of Piers of the East River Bridge. F. Collingwood.

Experiments with Cements and appliances for testing. Alfred Noble.

Comparison of Standard Measures, English, French and United States. Arthur S. C. Wurtele.

The Construction of Concrete Blocks at the end of the South Pass Jetties. Max E. Schmidt.

Notes as to construction and operation of the Railroad over the Baton Mountains, Col., and the construction and performance of the Locomotives thereon. James D. Burr.

Design and Construction Tables for Egg-shaped Sewers. Cyrus G. Force, Jr.

Members of the Society are earnestly requested to furnish information or memoranda upon any of the subjects referred to. They are also invited and expected to take part in the discussions either in person or by sending to the Secretary notes for presentation.

In either case, it will assist the Committee in arranging the details for sessions of the Convention, if Members expecting to take part in the discussions will notify the Secretary at once to that effect.

Excursions upon the Lake and by rail from Cleveland are contemplated, and the arrangements for them are in progress.

Invitation to visit Pittsburg and the Government Works for the Improvement of the river at that place (Davis Island Dam), has been extended by James H. Harlow, Member of the Society.

Please notify the Secretary whether you will visit Pittsburg, and whether you will present a paper or take part in the discussions at Cleveland.

The Title Page and Contents of Vol. VII, of the Transactions, and Title Page and Index of Vol. IV of the Proceedings, are issued with this number.

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LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

BELL, JAMES E.....	Superintendent City Water Works, Cincinnati, Ohio.....	March 5th, 1879.
BRUNER, DANIEL P.....	(Elected Junior, September 6th, 1876) 13 North Third street, Harrisburg, Pa.	May 7th, 1879.

ASSOCIATE.

GORDON, ALEXANDER...	General Manager Niles Tool Works, Hamilton, Ohio.....	March 5th, 1879.
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CHANGES AND CORRECTIONS.

MEMBERS.

BROWN, CHARLES O....	52 Wall street, Room 27, New York.
BRUSH, CHARLES B.....	13 Newark street, Hoboken, N. J.
BUCK, L. L.....	Engineer Suspension Bridge, Niagara Co., N. Y.
CHESTER, STEPHEN	5 and 7 Dey street, New York.
DURHAM, C. WHEELER...	109 Dearborn street, Chicago, Ill.
GARDNER, G. CLINTON...	Manager Troy, Greenfield and Hoosac Tunnel Railroad, Greenfield, Mass.
GRANT, WILLIAM H.....	Chief Engineer New York City and Northern Railroad and Yonkers Rapid Transit Railway, 3 Broad street, New York.

- HALL, G. THOMAS.....Division Engineer Metropolitan Elevated Railroad, 71 Broadway, New York.
- HARRIS, ROBERT L.....Consulting Engineer, Boston, Hoosac Tunnel and Western Railroad, North Adams, Mass.
- MERIWETHER, NILES.....Memphis, Tenn.
- NICOLLS, WILLIAM J.,....Editor Railway Record, 5 Post Office avenue, Baltimore, Md.
- PARKHURST, H. W.....Topeka, Kansas.
- PETTIT, HENRY.....209 South Third street, Philadelphia, Pa.
- SEARS, ALFRED T.....Ingeneiro de Estado, Peru, Chimbote, Peru, via Panama.
- SEDGWICK, THOMAS S....Washington, D. C.
- TURNER, EDMUND.....Engineer, Logansport, Crawfordsville and Southwestern Railroad, Crawfordsville, Ind.
- WALLING, HENRY F.....Marietta, Ohio.

ASSOCIATES.

- BREVOORT, HENRY L.....206 Broadway, New York.
- FORD, ARTHUR L.....Civil Engineer, Corinto, Nicaragua.

JUNIORS.

- BLAND, JOHN C.....Office Supervising Architect, Treasury Building, Washington, D. C.
- HAYES, EDMUND.....52 Wall street, New York.
- HORTON, SANFORD.....Division Engineer, Atchison, Topeka, and Santa Fé Railroad, Wichita, Kansas.
- KENNEDY, JAMES C....Engineer's Office, Water works, Ottawa, Canada.
- MACY, ARTHUR.....Kings Mountain Mine, Kings Mountain, N. C.

FELLOW.

- TAYLOR, WILLIAM J.....Chester, N. J.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V.—March, April, May, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MAY 21st, 1879.—The Society met at 8 P. M. Thomas C. Clarke in the chair.

A paper by J. James R. Croes, entitled "The Loss of Water in Flowing in Open Earth Channels, was read by the author, and discussed by Messrs. Dresser, Emery, Owen, Searles, Striedinger, L. B. Ward and Worthen.

NOTE.—At the meeting of the Society of May 7th, 1879, the following preamble and resolutions were passed :

Members of the Society are requested to favor the Secretary with their opinions on the subjects referred to, and with such other suggestions as they may wish to offer, sending the same in time for presentation at the Convention at Cleveland on June 17th, next.

Whereas, Every possible effort should be made to increase the sphere of usefulness of the Society, and to enlarge its membership as well as to promote active intercourse between all its members, therefore, be it

Resolved, That the following suggestions and such others as may be submitted, be printed and distributed among the members, with the request that they shall favor the Secretary as soon as possible with their

opinions, as well as with such other suggestions as they may wish to offer, so that action upon the same may be taken at the next convention.

SUGGESTIONS.

1st. That provision be made for the holding, in addition to the annual convention, a number of general meetings in various cities in each year, for professional intercourse.

2d. That papers be annually invited from members or other persons upon subjects of general engineering interest, to be specified by the Board of Direction.

3d. That a system be established to award special recognition for the best papers contributed each year.

4th. That present members be encouraged to propose worthy persons for new members, associates, and fellows.

5th. That to promote the discussion of papers, advance copies be issued to such members or other persons as may be specially qualified to take part in the same, or to members applying for them in order to take part in the discussion.

6th. That members be encouraged to make use of the facilities of the Society in New York for obtaining professional information.

7th. That the Library Committee be requested to report whether some plan may not be adopted to enable members living away from New York to consult the books of the Library, under proper regulations to ensure their return and to prevent injury.

8th. That suggestions be invited from members as to the feasibility of adopting some plan of affiliation with local engineers' clubs in other cities.

9th. That the desirability be discussed of appointing Research Committees, whose duties shall be to collect the results of existing experiments on any subject, and to suggest what further experiments are necessary, and also to collate such professional papers as may have been published elsewhere.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Alphabets adapted to the use of Architects, Engineers, Engravers, &c. Dan. T. Ames. New York. 12mo. *Bicknell & Comstock.* \$1.50.

Bridge Building, Girder Making and the Practice of Bridge Building in Wrought Iron. Illustrated by Examples of Bridges, Piers and Girder Work, &c., constructed at the Skerne Iron Works, Darlington. By Edward Hutchinson, Mem. Inst. M. E. 35 Plates, demy 8vo. London and New York. *Spon.* \$4.25.

Coal, Practical treatise on Combustion of Coal, incl. descriptions of various mechanical devices for the economic generation of Heat by the Combustion of Fuel, whether Solid, Liquid or Gaseous. W. M. Barr. Indianapolis. 8vo, illus. *Yohn Bros.* \$1.50.

Color Blindness; its Dangers and its Detection.

B. Joy Jefferies, M. D. Boston. 8vo. *Houghton, Osgood & Co.*

Drafting Instruments and Operations; in 4 Divisions: 1. Instruments and Materials; 2. Fundamental Operations; 3. Plane Problems and Practical Exercises; 4. Elements of Taste in Geometrical Drawing: Text-Book for Schools, and Artisans' Classes, and for Self-Instruction. S. E. Warren. New York, 2d ed. rev. and enl. 8vo, plates. *Wiley & Son.* \$1.25.

Electric Lighting and its Practical Application; with Results from Existing Experiments. J. N. Schoolbred. London, 8vo, illus. *Hardwicke & Bogue.* 6s.

English Army; its Past History, Present Condition and Future Prospects. Major Arthur Griffiths. 12mo. *Cassell, Pelter & Galpin.* New York. \$5.00.

- Gas Measurement.** The serious loss and inconvenience to gas companies and the public, caused by the freezing and inaccuracy of wet meters. George Glover. London. 8vo. *Spons.* 1s.
- Geometry; Elements of Co-ordinate —, in three parts: 1, Cartesian Geometry; 2, Quaternions; 3, Modern Geometry; and an Appendix.** De Volson Wood. New York. 8vo. *Wiley & Sons.* \$3.00.
- Mechanism; the Elements of Practical —.** T. Baker. London. Weales' Series. 6th ed. 12mo. *Crosby Lockwood.* 2s. 6d.
- Military Engineering. Instruction in —, Miscellaneous.** Compiled at the School of Military Engineering, Chatham. Vol. I. (Part 5). 2d ed. London. Post 8vo. *British Govt. Pub.* 3s. 6d.
- Military Map Making.** Captain Holdich. London. 8vo. *W. Mitchell.* 1s.
- Quantities and Measurements.** A. C. Beaton. London. Weales' Series. 5th ed. 12mo. *Crosby Lockwood.* 1s. 6d.
- River Shannon.** Paper on the —; its Present State, and the Means of Improving the Navigation and the Drainage; with Discussion thereon, before Section G, British Association, Dublin, 1878. By James Lynam, C. E. London. 8vo. *P. S. King.* 1s. 6d.
- Rivers Conservation.** Address of E. Easton, C. E., and papers read before the British Association at Dublin. 1878. London. 8vo. *P. S. King.* 2s. 6d.
- Royal Engineers. Professional Papers of the Corps of —, Vol. 2. Occasional Papers, 1878.** 8vo. Plates. *Chatham Royal Engineer Institute.* 12s.
- Sanitary Work in the Smaller Towns and in Villages.** Charles Slagg. London. Weales' Series. 12mo. *Crosby Lockwood.* 2s. 6d.
- Slide Rule, The Carpenter's: Its History and Use.** Containing Instructions for the Measurement of all kinds of Boards and Planks, Timber in the Round or Square, Glazier's Work and Paving, Brickwork, Pavement's Work, Tiling and Slatting, the Measurement of Vessels of various shapes, the Wedge, Inclined Planes, Wheels and Axles, Levers, the Weighing and Measurement of Metals and all Solid Bodies, Cylinders, Cones, Globes, Ship Carpenter's Eight Square Lines, the Measurement of Circles, and a Comparison of French and English Measures, with much other information useful to Builders, Carpenters, Bricklayers, Glaziers, Pavimenters, Slaters, and other Mechanics. Now first printed, in a complete form, at a moderate price. Fcap. 8vo, sd., pp. 32. *Ribone & Sons* (Birmingham). 3d.
- Steam Engines. Pocket Book on Compound Engines.** N. P. Burgh. London. 16mo. *Burgh.* 7s. 6d.
- Table Book.** Molesworth's Pocket Book of Useful Formulae and Memoranda, for Civil and Mechanical Engineers. With a valuable Contribution on Telegraphs, by R. S. Brough and Paget Higgs. 19th ed. 32mo. *Spons.* 6s.
- Thermodynamics.** Rob. E. Baynes. New York. 12mo. *Macmillan.* \$2.75.
- Universal Graphical Computing Table,** enabling anybody without calculation and at sight to multiply or divide any two numbers; to find 2d, 3d or 5th power of any number; to extract the 2d, 3d or 5th root of any number; to obtain the circumference or area of any circle; to obtain the volume of any sphere, or to multiply or divide by the sine, cosine, tangent or co-tangent of any arc; to reduce feet to metres or metres to feet. Invaluable to Engineers in making estimates; invaluable in preparing percentages or reducing statistics. Error of computation in all cases less than half of one per cent. Handsomely printed on Bristol Board 18 x 19 inches, and accompanied by a small volume of Text containing directions for use and valuable tables. By Lieut. Wm. H. Bixby. *Wiley & Sons.* New York. \$0.75.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From Administration des Ponts et Chaussées, Paris:
Annales. March, 1879.
- From American Chemical Society, P. Casanajor, Secretary, New York:
Journal of the Society. Vol. I, Nos. 1-3.
- From American Institute Mining Engineers, Thomas M. Drown, Secretary, Easton, Pa.:
Proceedings of the Baltimore Meeting, February, 1879.
The Bradford Oil District of Pennsylvania. Chas. A. Ashburner.
The Water Supply at the Bessemer Steel Works of the Edgar Thomson Steel Company, Limited. P. Barnes.
The Lake Superior Copper Rocks in Pennsylvania. J. F. Blandy.
The Great Blast at Glendon. Ellis Clarke, Jr.
- An Improved System of Cornish Pitwork. Ellsworth Daggett.
Note on the determination of Silicon in Pig Iron and Steel. Dr. T. M. Drown.
Indicator Cards from a Water-pressure Blowing Engine, with a note on a proposed improvement in such engines. Frank Firmstone.
The manufacture of Soda by the Ammonia process. O. J. Heinrich.
The Perrot Furnace. A. L. Holley, LL.D.
The United States Testing Machine at Watertown Arsenal. A. L. Holley, LL.D.
The Coal and Iron of the Hocking Valley, Ohio. T. Sherry Hunt, LL.D.
A Method of Rolling Steel or Iron Eye Bars. Charles Macdonald.
On the Classification of Original Rocks. Thomas Macfarlane.
Phosphorus in Coal. A. S. McCreath.

A Catalogue of Official Reports upon Geological Surveys of the United States and Territories and of British North America. F. Prime, Jr.

From Argentine Scientific Society, Don Felix Amoretti, Secretary, Buenos Ayres:
Annals of the Society. March and April, 1879.

From Association of Civil Engineers, Portugal:
Transactions. September, October, November and December, 1878; January and February, 1879.

From Wm. S. Barbour, City Engineer, Cambridge, Mass.:
Annual Report of City Engineer for 1878.
Fourteenth Annual Report of the Cambridge, Mass., Water Board, 1878.
The Mayors Address and Annual Reports made to the City Council of Cambridge, Mass.

From Walter A. Barlow, London:
Patentees' Journal of Dates. Vol II, No. 7, 1879. W. A. Barlow, Proprietor.

From H. Bartels, Berlin:
Betriebs-Einrichtungen auf Amerikanischen Eisenbahnen. 1. Bahnhofsanlagen und Signale. H. Bartels, Berlin, 1879.

From Mellen Chamberlain, Boston:
Bulletin of the Boston Public Library, April, 1878. Mellen Chamberlain, Librarian.

From Frederick Brooks, Boston:
Report of the Standing Committee of the Boston Society of Civil Engineers on the Metric System of Weights and Measures, presented March 19th, 1879. (5 copies.)

From Hon. Allan Campbell, Commissioner Department Public Works, New York:
Report of the Department of Public Works, quarter ending December 31, 1878.

From Civil Engineers' Club of the Northwest, L. P. Morehouse, Secretary, Chicago:
The Glasgow Bridge Superstructure. Chas. Sooy Smith.
Blasting under water in Rivers with rapid currents. F. W. Farquhar.

From Elliot C. Clarke, Boston:
Common Defects in House Drains. Elliot C. Clarke. Boston, 1879.

From H. Wadsworth Clarke, Syracuse, N. Y.:
Annual Report of the Superintendent of the Onondaga Salt Springs. A. C. Powell. Albany, 1879.
Journal of the Board of Supervisors of the County of Onondaga for 1878.
Report on the Management and Affairs of the Insane Asylum of the Onondaga County Poorhouse. (2 copies.)

From J. James B. Croes, New York:
Annual Report of the State Geologist of New Jersey for 1876.
Report of Water Commissioners of the City of Elizabeth, N. J., for 1868.

From George W. Dresser, N. Y.:
The Electric Light. A paper read before the Society of Gas Lighting, December 12, 1878. Eugene Vaudepool. (2 copies.)

From Charles D. Elliot, Somerville Mass.:
Annual Report of the Board of Harbor Commissioners for 1878.

From Charles E. Billin, Secretary Engineers' Club of Philadelphia:
Proceedings of the Club. Vol. I, No. 2.

From Sanford Fleming, Ottawa, Can.:
Report made to the Minister of Public Works of Canada in reference to the Canadian Pacific Railway. Ottawa, 1879.

From Franklin Institute, Philadelphia:
Journal of the Institute. April and May, 1879.

From George H. Frost, Editor *Engineering News*, New York:

Humber's Water Supply of Cities and Towns. Part 8.

Proceedings Engineer's Club of the Northwest:

1. Pier Constructions of Recent Date. G. A. M. Liljencrantz.
2. Anchor Ice as affecting public Water Supply. John A. Cole.

From Fred. de Funiak, Louisville, Ky.:
Cost of Road Repairs on Louisville and Nashville and South and North Alabama Railroads, for nine months ending March 31st, 1879.

From James T. Gardner, Albany:
Report of New York State Survey for 1878.

From Institution of Civil Engineers, James Forrest, Secretary, London:
Minutes of Proceedings. Vol. LV.

Publications edited by James Forrest, Secretary, as follows:

- (1.) The Geelong Water Supply. Edward Dobson.
- (2.) The Sandhurst Water Supply. Joseph Brady.

Discussions on the Geelong and Sandhurst Water Supplies.

Railway Bridge over the River Tyne, at Wylam, Northumberland. William G. Laws.

On the Best methods of Railway Construction for the development of New Countries. Robert C. Patterson.

Railway Work in Japan. W. P. Potter.
Method of Blasting Rock for the Lyttleton Harbor Works, Canterbury, New Zealand. George Thornton.

From the Institution of Mechanical Engineers, Walter R. Browne, Secretary. London:

Proceedings. January, 1879.

From the Imperial Technic Society, St. Petersburg, Russia:

Notes of the Imperial Technic Society. Part XII. 1878. (Russian.)

From the Iron and Steel Institute. London:

Journal of the Institute, No. 2. 1878.

From John Kennedy, Montreal, Canada:
Annual Report of the Harbor Commissioners of Montreal for 1878.

From Geo. A. Kimball, City Engineer, Somerville, Mass.:

Annual Reports. City of Somerville, Mass., 1878.

First Annual Report of the Board of Health of Somerville, Mass.

Fifth Annual Report of the City Engineer of Somerville, Mass., 1878.

From J. F. Klein, D. E., Philadelphia:
Concerning $\frac{T_1 - T_0}{T_1}$ or the Limit of efficiency of Heat Engines. J. F. Klein, Philadelphia, 1879.

From State Board of Health of Massachusetts. Charles F. Folsom, M. D., Secretary:
Tenth Annual Report of the State Board of Health. January, 1879.

From E. E. Middleton, London:
Impeachment of Modern Astronomy. E. E. Middleton. London, 1879.

From George S. Morison, New York:
Annual Report of the Eastern Railroad Company, 1877-78. Boston, 1878.

From Edward P. North, New York:
Report of the President and Directors of the Northern Pacific Railroad. September 25th, 1878.

From the North of England Institute of Mining and Mechanical Engineers. Theo. Wood Bunning, Secretary. Newcastle-on-Tyne, England:
Transactions of the Institute, February and March, 1879.

From Charles Paine, Cleveland, Ohio:
Ninth Annual Report of the Lake Shore and Michigan Southern Railroad for 1878.

From Wm. H. Paine, Brooklyn, N. Y.:
Specifications for the Steel and Iron Work of the Suspended Superstructure of the East River Bridge.

From Francis Rinecker, Würzburg, Germany:
Der Logarithmische Rechenschieber und seine praktische Anwendung. F. Rinecker. Würzburg, 1879.

Die Hydrometrische Waage in ihrem Principe, Wesen und Gebrauch. Franz J. V. Czernwenka. Vienna, 1878.

From the Publishers Revue Général des Chemins de fer. Edgar Monjean, Secretary, Paris:
Revue Général des Chemins de fer. January and February, 1879.

From Saxonian Society Engineers and Architects, Leipzig:

Transactions of the Society. Part II, 1878.
From Hon. Horatio Seymour, Jr., State Engineer and Surveyor. Albany;

Annual Report of the New York State Canals for 1878.

From John C. Trautwine, Philadelphia:
Aide Memoire portatif a l'usage des officiers du Génie. Vols. I and II. J. Laisné. Paris, 1861.

A treatise on Internal Navigation. Report of Albert Galatin on Roads and Canals. Ballston Spa, N. Y., 1817.
Bree's Railway Practice. London, 1847.

Bree's Railway Practice. Plates. Vols. I, II, and III.

Bridging the Hudson. Testimony taken before the Senate Committee in the matter of bridging the Hudson River at Albany, February 29th, 1856.

The Miscellaneous papers of John Smeaton, C. E., F. R. S. London, 1814.

Reports of the late John Smeaton. C. E., F. R. S. Vols. I, II and III. London, 1812.

Report of the Department of Mines of Nova Scotia for 1878.

Reports of the Pennsylvania Central Railroad. Two volumes. Volume I, 1848-1855. Volume II, 1856-1860.

Traité Élémentaire des Chemins de fer. Vols. I and II. Aug. Perdonnet. Paris, 1860.

From Edgar B. Van Winkle, New York:
Conditions of Proposals for constructing Sewers and their Appurtenances in Third avenue from Southern Boulevard to 135th street; and in 135th street and 134th street, from Third avenue to Sunnyside east of Willis avenue, with branches in Lincoln, Alexander and Willis avenues.

Conditions of Proposals for Constructing Sewers and Appurtenances in 140th street, from Alexander avenue to Brook avenue, with branches in Alexander and Willis avenues.

Proposals for regulating and grading Third avenue in 23d Ward, and for additional work in said avenue between 147th street and Harlem River.

From D. Van Nostrand, New York:
Van Nostrand's Engineering Magazine. May and June, 1879.

From F. Leyppoldt, New York:
The Library Journal. No. 3. Vol. IV.

From Prof. Wm. Watson, Boston:
Reports upon the Public Works of Italy by the Minister of Public Works. 4 folio volumes with full plates.

ANNOUNCEMENTS.

THE ELEVENTH ANNUAL CONVENTION of the Society will be held at Cleveland, beginning Tuesday, June 17th, 1879.

Sessions for the consideration of professional subjects, and one for the transaction of business will be held.

The details of the programme will be announced as soon as determined by the local committee.

The following is a list of topics to be considered with reference to papers published in Transactions during the preceding year:

AMERICAN ENGINEERING AT INTERNATIONAL EXHIBITIONS.

CLXXIV. American Engineering as illustrated at the Paris Exposition of 1878. George S. Morison, Edward P. North and John Bogart.

BRIDGES.

— Discussion of Paper CXL. The Determination of Stresses in the Eye-Bar Head. De Volson Wood. Vol. VII, page 189.

— Discussion of Papers CXLIV and CXLIX. Relative Quantities of Material in Bridges of different kinds, of various heights. William H. Searles. Vol. VII, page 192.

CEMENTS.

— Discussion on Cements. Don J. Whittemore. Vol. VII, page 274.

— Discussion on Cements and Strength of Bricks. F. Collingwood. Vol. VII, page 280.

FOUNDATIONS.

CLXXII. The use of Compressed Air in Tubular Foundations, and its application at South Street Bridge, Philadelphia, Pa. D. McN. Stauffer.

HYDRAULICS.

CLX. On the Cause of the Maximum Velocity of Water flowing in Open Channels being below the Surface. James B. Francis.

CLXI. The Flow of Water in Pipes under Pressure. Charles G. Darrach.

— Discussion on the Cause of the Maximum Velocity of Water flowing in Open Channels being below the Surface, and also on the Flow of Water in Pipes under Pressure. Theo. G. Ellis, C. E. Emery, Clemens Herschel, De Volson Wood and John T. Fanning. Vol. VII, page 122.

CLXVII. Distribution of Rain-fall during the great storm of October 3d and 4th, 1869. James B. Francis.

CLXVIII. The Gauging of Streams. Clemens Herschel.

CLXXV. The Flow of Water in Small Channels, after Ganguillet and Kutter, with Kutter's Diagram modified, and Graphical Tables with special reference to Sewer Calculations. R. Hering.

MASONRY.

CLXX. Brick Arches for Large Sewers. R. Hering.

— Discussion on Brick Arches for Large Sewers. E. S. Chesbrough, W. Milnor Roberts, R. Hering and F. Collingwood. Vol. VII, page 258.

CLXXI. Fall of Western Arched Approach to South Street Bridge, Philadelphia, Pa. D. McN. Stauffer.

— Discussion on Nomenclature of Building Stones and Stone Masonry. J. Foster

Flagg, J. J. R. Croes, J. P. Davis, F. Collingwood, J. Veazie and E. P. North. Vol. VII, page 284.

METALS.

CLXIII. On a newly discovered relation between the Tenacity of Metals and their resistance to Torsion. Robert H. Thurston.

CLXIV. Observations on the Stresses developed in Metallic Bars by Applied Forces. Theodore Cooper.

PRESERVATION OF TIMBER.

CLXXVI. The Permanent Way of Railways in Great Britain and Ireland, with special reference to the use of Timber, preserved and unpreserved. Compiled from information received from Engineers in charge of those railways. John Bogart.

RAILROADS.

CLIX. On the Theoretical Resistance of Railroad Curves. S. Whitney.

— Discussion on the Resistance of Railroad Curves. O. Chanute, Chas. E. Emery, E. Yardley, E. P. North, C. L. McAlpine, F. Collingwood and Wm. H. Paine. Vol. VII, page 97.

CLXVI. Reminiscences and Experiences of Early Engineering Operations on Railroads, with especial reference to Steep Inclines. W. Milnor Roberts.

— Discussions on Inclined Planes for Railroads. O. Chanute and William H. Paine. Vol. VII, page 216.

RIVERS AND HARBORS.

CLXII. The South Pass Jetties. Descriptive and Incidental Notes and Memoranda. E. L. Corthell.

— Discussions on the South Pass Jetties. Charles W. Howell, E. L. Corthell, C. Shaler Smith, J. Foster Flagg. Vol. VII, page 159.

CLXIX. The Dangers threatening the Navigation of the Mississippi River and the Reclamation of its Alluvial Lands. B. M. Harrod.

STEAM ENGINES.

CLXV. Cushioning the Reciprocating Parts of Steam Engines. John W. Hill.

— Discussion on Steam Engine Economy. J. Foster Flagg and E. D. Leavitt, Jr. Vol. VII, page 194.

SUBMARINE TELEPHONY.

CLXXIII. Submarine Telephoning. Chas. Ward Raymond.

In addition to the above papers, it is expected that the following subjects will be pre-

mented by papers printed previous to the date of the Convention, or read at its meeting:

Engineering Questions involved in the Development of Electric Lighting. Stephen Chester.

Gelatine Dynamite and High Explosives. Ju'lus H. Striedinger.

Lighthouse Construction. J. G. Barnard.

Memoir upon the Construction of the Minots Ledge Light. B. S. Alexander.

The Construction and Maintenance of Roads. Edward P. North.

The Resistances of Railway Rolling Stock. A. M. Wellington.

The Railroad Crossing of the Allegheny Mountain. Moncure Robinson.

Notes on Early Railroad Engineering. Ashbel Welch.

Remarks on the Causes of Fall of the Western Arched Approach to South Street Bridge, Philadelphia, Pa. J. G. Barnard.

Parabolic Arches in Masonry. W. A. G. Emonts.

Notes on the Foundations of Piers of the East River Bridge. F. Collingwood.

Experiments with Cements and appliances for testing. Alfred Noble.

Comparison of Standard Measures, English, French and United States. Arthur S. C. Warfle.

The South Pass Jetties; the consolidation and durability of the works, with description of the Concrete Blocks and other constructions of the past year. Max E. Schmidt.

Notes as to construction and operation of the Railroad over the Raton Mountains, Col., and the construction and performance of the Locomotives thereon. James D. Burr.

Design and Construction Tables for Egg-shaped Sewers. Cyrus G. Force, Jr.

Traction Experiments to Determine the Resistance of Vessels in narrow Channels or Canals. E. Sweet, Jr.

Wind Pressure. F. Collingwood.

Flexure and Transverse Resistance of Beams. C. E. Emery.

Stability of Stone Piers. Wm. H. Searles.

Cadastral Maps in Ohio. H. F. Walling.

Telford Pavements. James Owen.

A number of members have already signified their intention of taking part in discussions of the papers.

Members of the Society are earnestly requested to furnish information or memoranda upon any of the subjects referred to. They are also invited and expected to take part in the discussions either in person or by sending to the Secretary notes for presentation.

In either case, it will assist the Committee in arranging the details for sessions of the Convention, if Members expecting to take part in the discussions will notify the Secretary at once to that effect.

Excursions upon the Lake and by rail from Cleveland are contemplated, and the arrangements for them are in progress.

The Secretary is instructed to state that it is permissible that Members of the Society should be accompanied by their families.

Invitation to visit Pittsburg and the Government Works for the improvement of the river at that place (Davis Island Dam), has been extended by James H. Harlow, Member of the Society.

Please notify the Secretary whether you will visit Pittsburg, and whether you will present a paper or take part in the discussions at Cleveland.

Under the rule adopted by the Society in reference to invitations to Conventions, the members of the Boston Society of Civil Engineers, of the Engineers' Club of the Northwest, of the Engineers' Club of St. Louis, of the Engineers' Club of Philadelphia, and of the American Institute of Mining Engineers; also, the Editors of Professional Journals exchanging with this Society have been invited to attend the Convention and the excursions connected therewith.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every Thursday evening, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

		Date of Election.
RICHARDSON, HENRY B...	Assistant State Engineer, St. Joseph, La.....	May 7th, 1879.
SCHMIDT, MAX O. E.....	Chief Assistant Engineer, South Pass Jetties, Port Eads, La.....	“ “

ASSOCIATE.

ROBERTS, PERCIVAL, JR....	265 South Fourth street, Philadelphia, Pa.....	May 7th, 1879.
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CHANGES AND CORRECTIONS.

MEMBERS.

CISNEROS, FRANCIS J.....	311 West Thirty-third street, New York.
SITES, WILMON W. C.....	Architect and Civil Engineer, 8 Oakland avenue, Jersey City, N. J.
SPIELMAN, ARTHUR	13 Newark street, Hoboken, N. J.

JUNIOR.

TASKER, CHARLES A.....	Care of John H. Dailey, Cincinnati Southern Railway Office, 80 West Third street, Cincinnati, Ohio.
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FELLOW.

COURTWRIGHT, MILTON....	19 Courtlandt street, New York.
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American Society of Civil Engineers.

PROCEEDINGS.

Vol. V.—June, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JUNE 4TH, 1879.—The Society met at 8 P.M. Thomas C. Clarke in the chair.

Ballots for admission to membership were canvassed, and the following were declared elected as members :

Charles Albert Allen of Worcester, Mass.; John Carlisle Bland (elected Junior, May 5th, 1875,) of Philadelphia, Pa.; Edward Bates Dorsey of San Francisco, Cal.; Sullivan Haslett of Brooklyn, N.Y.; and Charles Herne McKee of Albany, N.Y. Also as Fellow, Frederick Oakford Norton of New York.

A communication was presented from N. H. Whitten, Member of the Society, accompanying a communication from the Holyoke Water Power Company, and from the Mayor of the City of Holyoke, inviting this Society to designate an Engineer to attend a trial of Turbines at Holyoke, Mass.*

* The City Government of Holyoke realizing the importance of the following proposition, join with the Water Power Company in inviting the Locks and Canals Company of Lowell, Mass., to send Mr. Francis as Engineer, the City of Philadelphia, Pa., to send an Engineer familiar with the pumping of water for that city, the National Millers' Association to send an Engineer familiar with milling matters, the American Society of Civil Engineers to send an Engineer as representative of that Society, and the representatives of the owners of the turbines furnished for trial to select an Engineer to care for the interests of turbine builders, the five to be guests of the city during the trial, to have full charge of the tests and at the close to report the results in accordance with the proposition of the Water Power Company to the Mayor of this city in order that the said report may be officially promulgated.

Approved.

WM. WHITING, *Mayor*.

J. E. DELANEY, *City Clerk*.

On Motion, the following resolution was adopted: Resolved, that this Society accepts the invitation of the Holyoke Manufacturing Company and the city authorities of Holyoke, Mass., to send a representative to attend the proposed tests of turbines, and that the Board of Direction be requested to designate a member of the Society for that purpose.

A description of a proposed connected girder was presented by Charles E. Emery, and the subject discussed.

JUNE 18TH, 1879.—Regular meeting of the Society, held during the Convention at Cleveland.

The Society met at 8½ P. M. Director Theodore G. Ellis in the chair.

The Committee on Uniform Accounts and Returns of Railroad Companies presented a report* which was read by the Secretary, and on motion the report was accepted and the committee discharged.

The Committee on Tests of American Iron, Steel and other Metals presented a report† which was read by its Chairman, W. Sooy Smith.

On motion the report was accepted and adopted.

HOLYOKE, MASS., May 17, 1879.

To the Secretary of the American Society of Civil Engineers,

New York City:

DEAR SIR:

In behalf of the citizens of Holyoke I hereby cordially invite the co-operation of your Association in accordance with the above.

WM. WHITING, Mayor.

HOLYOKE WATER POWER COMPANY.

NOTICE TO TURBINE BUILDERS AND MANUFACTURERS.

The practice of testing turbines, so common the past ten years, has undoubtedly done much towards bringing the best into use; but there has been one serious defect in the system; that is, the practice has generally been confined to the trial of small wheels, owing to the great expense that would be caused by the tests of large sizes. As it is a matter of vast importance that the best turbine plans should be established beyond chance for doubt, this company contemplate providing means for a thorough competitive test of the various kinds of turbines that may be offered for trial, and to invite Water Power Companies, Cities that pump their water supply, and all others interested in the matter, to take part in it. The requirements will be, that the wheels shall be ready for test when delivered at the Holyoke Testing Flume, and that each builder shall superintend the setting of his wheel; the setting and testing to be done at the expense of the Water Power Company. Capacity of each wheel to be sufficient to discharge about 5 000 cubic feet of water per minute, under 18 feet head. Each wheel will be thoroughly tested from half to whole gate, and if deemed best, under at least two different heads; also under several feet of back water. At the conclusion of the trial, a full report will be made of the results obtained and of the workmanship, and probable durability of each kind of wheel tried. Turbine builders of this or any other country are invited to furnish wheels, and those proposing to do so, should give notice of such intention as soon as possible.

Test to commence first day of September next.

WM. A. CHASE, Agent.

HOLYOKE, MASS., April 10, 1879.

* See page 33. † See page 36.

W. Sooy Smith moved that the Committee be discharged and that a new committee of seven be appointed for the same duty, which motion was lost.

The committee was continued as now composed.

The Committee on Finance then made a report through the chairman, William H. Paine, which on motion was accepted.

The Committee on the Exhibit of the Society at the Paris Exposition made a report of progress through E. P. North, which was on motion accepted.

The following resolution was presented (by letter) by Ernest W. Bowditch, and was, under By-law 23, referred to the Board of Direction for issue of letter ballot :

Resolved, that a standing committee of seven, representing different sections of the country, be appointed from the American Society of Civil Engineers, who shall examine into the entire subject of the preservation of timber and report to the Society from time to time, and who shall collect such samples and data as they may be able, to aid in determining the relative values of the different woods, both preserved and unpreserved, in ordinary use in various parts of the country.

The following resolution was offered by Charles Latimer, and was, with a recommendation for its adoption, under By-law 23, referred to the Board of Direction for issue of letter ballot :

Resolved, that a committee of seven members of the Society be appointed by the Board of Direction to devise and report a uniform system for tests of cement.

The suggestions referred to the Convention at the meeting of May 7th, 1879, (see Proceedings, Vol. V., page 21,) were then taken up and read.

The following additional suggestion was presented, by letter, from William P. Shinn :—That the papers and reports of committees on professional subjects should be allowed to be printed by any or all of the technical journals that think proper to publish them.

The following resolution was offered by O. Chanute :

Resolved, that it is the sense of this meeting that the Board of Direction should take immediate steps to provide for the holding in various cities of three general meetings in each year in addition to the general Convention, for purposes of professional intercourse.

The resolution was discussed by Messrs. Flagg, Bogart, Searles, Cooper, Latimer, Macdonald, Metcalf, Elliot and Chanute.

It was moved by O. Chanute to strike out the word "three" and instead thereof to insert "one or more."

The amendment was lost.

The original motion was lost.

The following resolution was offered by O. Chanute :—Resolved, that the Board of Direction be requested to issue advance copies of papers to

such members or other persons as may be specially qualified to take part in the discussion of the same. That members should be encouraged to make use of the facilities of the Society in New York for obtaining professional information, so far as the same may be secured without entailing onerous labor or expense upon the Secretary.

The resolution was discussed by Messrs. Rotch, Chanute, Flagg and Smedley.

The resolution was adopted.

The following resolution was offered by O. Chanute :—That a Research Committee of five be appointed by the Board of Direction, if authorized by letter ballot, whose duties shall be to collect and publish annually the results of existing experiments upon any subject ; to suggest what further experiments are necessary, and also to collate such professional papers as may have been published elsewhere.

This resolution was adopted.

On motion the following, being the second suggestion of May 7th, was adopted as a resolution :—That papers be annually invited from members or other persons upon subjects of general engineering interest, to be specified by the Board of Direction.

On motion the following resolution, based upon the third suggestion of May 7th, was adopted :—Resolved, that the Board of Direction be requested to submit, in the usual manner, a system to award special recognition for the best papers contributed each year.

On motion the following, being the seventh suggestion of May 7th, was adopted :

That the Library Committee be requested to report whether some plan may not be adopted to enable members living away from New York to consult the books of the Library, under proper regulations to ensure their return and to prevent injury.

The following resolution was offered :—That the papers and reports of committees on professional subjects shall be allowed to be printed in any or all journals that think proper to publish them.

This resolution was discussed by Messrs. Dresser, Flagg, Cotton, Emery, Latimer and C. Shaler Smith.

The resolution was adopted.

On motion of F. Collingwood, the Committee on Tests of American Iron, Steel and other Metals were thanked for the work it has done.

The Society then adjourned.

OF THE BOARD OF DIRECTION.

MAY 31ST, 1879.—Applications for membership were considered. Arrangements for the approaching Convention were perfected ; appropriations were made, and general business transacted.

JUNE 30TH, 1879.—Applications for membership were considered. In accordance with the resolution adopted by the Society (see page 00), requesting the Board of Direction to designate a member of the Society to attend the proposed test of turbines at Holyoke, Mass., the Board designated William E. Worthen as such member, and in case of his declination or inability to serve, the Board designated Charles E. Emery as an alternate. The Library Committee made a report in reference to the conditions of award of the Norman Medal, which was accepted and forwarded to George H. Norman for his consideration. Appropriations were made.

REPORTS OF COMMITTEES.

PRESENTED AT THE TENTH ANNUAL CONVENTION.

REPORT OF THE COMMITTEE ON UNIFORM ACCOUNTS AND RETURNS OF RAILROAD COMPANIES.

To the American Society of Civil Engineers :

Your Committee on "Uniform Accounts and Returns of Railroad Companies" beg leave to report that, in addition to the influence which the members of your Committee have been able to exert in the furtherance of the object of their appointment, the matter of uniform accounts and returns has been very strongly advocated by Mr. C. F. Adams, Jr., Railway Commissioner of Massachusetts, and that, in consequence of our united efforts, a meeting of the Railway Commissioners of several States was called to be held at Columbus, Ohio, on November 12th, 1878, at which meeting it was the intention of the Chairman of your Committee to have been present, but by some mistake he was advised that the meeting would be held on the 14th, which mistake was not corrected until the day of the meeting. At that meeting a committee was appointed, with instructions to solicit the co-operation of six parties named as experts in railroad accounts, one of whom was the chairman of your Committee.

This General Committee of Commissioners and Experts was called together and held a meeting at the St. Nicholas Hotel, New York, on April 24th, 1879, where the following subjects were discussed :

1st. The general principles upon which accounts should be required to be kept by railroad companies.

2d. The form of returns to be required to be made by railroad companies to the State authorities.

The Chairman of your Committee attended this meeting and took active part in its discussions, as the result of which certain general rules were adopted to govern the keeping of accounts, and a form of returns was agreed upon, with the exception of the heads under which expense should be classified, which was left for further consideration by the Committee, at a meeting to be held June 10th. The rules and forms of returns, so far as adopted by the Committee, are appended hereto.

The Chairman of your Committee was invited to attend the meeting on June 10th, but regrets to say that by reason of ill health he was unable to do so. He is advised, however, by the Secretary of the meeting, that the rules as agreed upon by the Committee at the meeting of April 24th were adopted, and a form for division of expense accounts was agreed upon and adopted, which form is also appended hereto. It only remains, therefore, for the Commissioners of the several States to procure such legislation as will enable them to adopt the agreed forms, when uniform accounts and returns will have been accomplished so far as the States are concerned which have railroad returns.

Opposition may be expected from some

ailroad companies to the requirements of the rules adopted by the Commissioners, but experience in Massachusetts indicates that such opposition will gradually yield, and the railroad companies will find it to be an advantage in the end.

Respectfully submitted.

WM. P. SHINN,
O. CHANUTE,
FRED. DE FUNIAK, } Committee.

APPENDIX.

RULES, ETC.

A meeting of the Committee of Railroad Commissioners and Railroad Accountants on "Uniform System of Accounts and Returns," appointed at the General Convention of Railroad Commissioners in November last, was held at the St. Nicholas Hotel, New York City, Thursday, April 24, 1879, as per call of the Chairman, Mr. Woodruff of Connecticut.

There were present of the Committee: Messrs. Woodruff of Connecticut, Carter of Virginia, Turner of Wisconsin, Railroad Commissioners; Messrs. Leland of Ohio, Shinn of Pennsylvania, Wilbur of Boston, Railroad Accountants; and J. H. Goodspeed, Secretary; also, by invitation, Gen. F. A. Walker, Railroad Commissioner of Connecticut, and Mr. George E. Towne, Accountant, of Boston.

On a general discussion of the matter before the Committee, it was unanimously voted,—

"That it is the sentiment of the Committee that the system of accounts and returns should include a showing in detail of the annual operation."

The following general rules, in regard to the manner of keeping accounts from which the returns are to be made, were discussed and adopted:

I.

All liabilities (including interest accrued on funded debt) shall be entered upon the books in the month when they are incurred without reference to date of payment.

II.

Expenses shall be charged each month with such supplies, materials, &c., as have been used during that month, without reference to the time when they were purchased or paid for.

III.

No expenditure shall be charged to property accounts, except it be for actual increase

in construction, equipments or other property, unless it is made on old work in such a way as to clearly increase the value of the property over and above the cost of renewing the original structures, &c.

In such cases, only the amount of increased cost shall be charged, and the amount allowed on account of the old work shall be stated.

IV.

Mileage of passenger and freight trains shall include only the miles shown to be run by distances between stations; allowances made to passenger or freight trains for switching, and all mileage of switching engines computed on a basis of ten miles per hour for the time of actual service, shall be stated separately.

V.

Season ticket passengers shall be computed on the basis of twelve (12) passengers per week for the time of each ticket.

VI.

Local traffic should include all passengers carried on local tickets, and all freight carried at local tariff or special local rates.

All other traffic shall be considered through.

The form of return upon which the reports are to be made to the Commissioners was taken up and decided upon, with the exception of the division of operating expenses.

A form of division of operating expenses was submitted by Mr. Towne, and the Secretary was instructed to send copies of the same, together with the rules and form adopted, to the different members of the Committee, asking them to take it under consideration for discussion and final decision at the next meeting of the Committee, to be held at the time of the General Convention of Railroad Commissioners in June next.

The form of return as adopted by the Committee is as follows:

GENERAL EXHIBIT.

Total income.....	.....
Total expense .....	.....
Net income.....	.....
Interest on funded debt.....	.....
" " unfunded debt.....	.....
Rentals.....	.....
Balance applicable to dividends.....	.....
Dividends declared (per cent.).....	.....
Balance for the year.....	.....

Balance (profit and loss) last year.....
 (Add or deduct various entries made
 during the year not included above
 (specifying same).)

Balance (profit and loss) carried forward
 to next year.....

CHARGES AND CREDITS TO PROPERTY DURING THE YEAR.

Construction and equipment (specifying
 same).....
 Other charges (specifying same).....
 Total charges.....
 Property sold or reduced in value (speci-
 fying same).....
 Net addition (or reduction) for the year ..

ANALYSIS OF EARNINGS AND EXPENSES.

Earnings :

From local passengers.....
 Through
 Express and extra baggage.....
 Mails.....
 Other sources, passenger department..
 Total earnings passenger department....
 Local freight.....
 Through freight.....
 Other sources, freight department.....
 Total earnings, freight department.....
 Total transportation earnings.....
 Rents from use of road.....
 Income from other sources (specifying
 same).....

Total income from all sources....

EXPENSES.

(See form submitted.)

ASSETS AND LIABILITIES.

Assets :

Construction account.....
 Equipment ".....
 (Locomotives, No.)
 (Parlor and sleeping cars, No.)
 (Passenger cars, No.)
 (Baggage and mail cars, No.)
 (Freight cars, No.)
 (Other cars, No.)
 Other investments (specifying same).....
 Cash items :
 Cash
 Bills receivable.....
 Due from agents and companies
 Other assets :
 Materials and supplies

Sinking funds.....
 Debit balances.....

Total assets.....

Liabilities :

Capital stock (as specified below).....
 Funded debt (as detailed below).....
 Unfunded debt, as follows :
 Interest unpaid.....
 Dividends unpaid.....
 Notes payable
 Vouchers and accounts
 Other liabilities.....
 Profit and loss or income accounts.....

Total liabilities.....

PRESENT OR CONTINGENT LIABILITIES NOT IN- CLUDED IN BALANCE SHEET.

Bonds guaranteed by this company of a
 lien on its road (specifying same)....
 Overdue interest on same.....
 Other liabilities (specifying same).....

MILEAGE, TRAFFIC, ETC.

Mileage passenger trains.....
 Freight ".....
 Switching ".....
 Other ".....

Total train mileage.....

Miles run by passenger, mail, and baggage
 cars (north or east).....
 Miles run by passenger, mail, and baggage
 cars (south or west).....
 Miles run by freight cars (north or east)..
 " " " (south or west)..
 Number of season ticket passengers.....
 Number of local passengers (including
 season).....
 Number of through passengers.....
 Total number of passengers carried.....
 Mileage of local passengers (north or east)
 " " " (south or west)
 Mileage of through passengers (north or
 east).....
 Mileage of through passengers (south or
 west).....

Total passenger mileage.....

Number tons local freight carried.....
 " " through " ".....
 Total tons freight carried

Mileage of local tonnage (north or east)..
 " " " (south or west) ..

Mileage of through tonnage (north or east)
 " " " (south or west)

Total freight mileage

Average weight of passenger trains

" number of cars in passenger

trains

Average weight of freight trains

" number of cars in train

" " persons employed

Length of road, branches, sidings, &c.

Names of officers and directors

Corporate name of company

OPERATING EXPENSES.

Salaries general officers and clerks

Law expenses

Insurance

Stationery and printing

Outside agencies and advertising

Contingencies

Repairs bridges (including culverts and
 cattle guards)

Repairs buildings

" fences, road crossings, and signs

Renewal rails

Renewal ties

Repairs roadway and track

" locomotives

Fuel "

Water supply

Oil and waste

Locomotive service

Repairs passenger cars

Passenger train service

" " supplies

Mileage passenger cars

Repairs freight cars

Freight train service

" " supplies

Mileage freight cars

Telegraph expenses (maintenance and
 operating)

Damage and loss freight and baggage

" " property and cattle

Personal injuries

Agents and station service

Station supplies

Total operating expenses

Taxes

Total operating expenses and

taxes

REPORT OF COMMITTEE ON TESTS OF AMERICAN IRON AND STEEL.

To the American Society of Civil Engineers :

Your Committee on Tests of American Iron and Steel begs leave to submit the following report: At the Annual Convention of the Society, held at the City of Chicago seven years ago, your Committee on Tests was created. By frequent reports, and by papers read before the Society, you have been kept fully advised of the efforts made by the committee to procure from Congress the necessary appropriations for carrying on the work of the United States Testing Board. You have also been informed of the scheme of investigations devised by the Board, and the progress made in such investigations. Two appropriations have been obtained, amounting in the aggregate to ninety-four thousand three hundred and ninety-six dollars and ninety-eight cents—the odd dollars and cents accruing by the addition of an unexpended balance to a round sum. The act making the last appropriation provides that when the money has been expended the Board shall cease to exist, and that the testing machine built under the direction of the Board, and for its use, shall be turned over to the Secre-

tary of War. As you are aware, the machine was but recently completed. By directions given the Board at the time of its organization, this machine has been erected at the Watertown Arsenal, situated at Watertown, Massachusetts. As soon as it is turned over to the Secretary of War it drops into the possession of the United States Ordnance Department, subject to this further provision of the act referred to, that parties desiring to have tests made can do so by paying for the same. The money will all be expended before the end of the present fiscal year, which closes June 30th, inst. At the end of this month, then, the machine will be turned over and the United States Testing Board will cease to exist. For seven years your committee has importuned Congress for the necessary appropriations, with such measure of success as has been reported to you. For four years the Board has labored under many difficulties to plan and carry forward the work confided to it. A plan of investigation, which has received the hearty approval of this Society and of eminent engineers throughout the world, has been arranged. Such investigations as

could be economically and effectively carried on without the use of the long delayed machine, have been faithfully prosecuted by some of the sub-committees of the Board, and as a foretaste of the valuable results anticipated by us all from the labors of the United States Testing Board reports have recently been made by these committees, which will at once become standard authority on the subjects treated. Our Society, the Testing Board, and the country at large, have compensation for the long delay in the completion of the testing machine, in its unprecedented excellence, now that it is done. The labors of the Board, but just begun, have yielded benefits worth many times the gross amounts of the money appropriated, and our Government has for future use by far the best testing machine in the world.

From time to time, during the last seven years, your committee has performed the distasteful duties which devolve upon the "third house" at Washington, not corruptly, but honestly and earnestly commending a most worthy object to the attention and support of the Government. In the performance of this work its members have willingly spent large sums of money in necessary expenses and much valuable time, glad of the opportunity to make this contribution to so important a branch of scientific inquiry. Many members of the Society, and some of the manufacturers of iron and steel, besides numerous scientific societies and institutions of learning, have aided the committee with their valuable influence. To all these your committee desire to return sincere thanks. And we desire to ask that you will overlook or forgive the shortcomings which have occurred in our efforts to perform the duties assigned to us.

Engineers throughout our country realize the urgent need of the knowledge which the tests proposed were designed to procure. The country at large realizes it and fully approves the appropriation of the public money for this beneficent purpose.

Appropriations have been obtained; the necessary machinery has been provided; the Board seemed well selected; the work was auspiciously begun, when a bolt shot from a sky that was already lowering when we held our convention in New Orleans, two years ago, struck the United States Testing Board, the pet child of our Society, dead.

If you cannot weep over its fall, picture to yourselves the tragedies which result from the ignorance which it was created to remove,

and think of the symmetry, strength and perfection of the structures which American engineers would have given to the world, aided by the knowledge which this effort was designed to procure.

Who, we ask the "American Society of Civil Engineers," are the rightful owners of the testing machine and other appliances procured with the people's money for the use of the United States Testing Board? If the people, then let it be retained in the service of the people to promote the common interests of the country and not be turned over to any single bureau or department of the Government specially skilled only in a particular line of inquiry.

The knowledge we so much desire and so sorely need, can only be obtained by a mixed Board of experts independent of the control of any particular governmental department, except so far as the honest expenditure of the money appropriated is concerned.

Now, what will our Society, with its membership of six hundred, distributed in every State and Territory of the United States, do in this matter? Have we the necessary power and influence to induce the Government to right the grievous wrong that it has done us? Or are we a mutual admiration society which meets periodically to air fine spun theories, in utter unconsciousness of the density of the ignorance that envelops us? If these questions are couched in language lacking grace or courtesy, the Society is asked to pardon the want, and to remember that the threatened failure of an effort earnestly prosecuted for seven years, is likely to provoke strong language.

Your committee respectfully recommends that a new committee be appointed, the Chairman of which should reside at or near Washington, and that a ten times more vigorous effort than any yet made by the Society be put forth to recover what has been lost by inattention. As engineers, and as a society, we owe it to the Committee and Board who have labored so long without pay, to procure the means and to make the tests. We owe it to our country and to the world, since the work had been so auspiciously begun, to see to it that it shall not be permitted to fall until the knowledge we so much need, and which is now just within our grasp, has been secured and thoroughly digested and prepared for common use.

WM. SOOY SMITH,
Chairman of Committee on Tests.

REPORT OF THE FINANCE COMMITTEE.

PRESENTED VERBALLY BY WILLIAM H. PAINE, CHAIRMAN.

I did not expect to make a report this evening, but being acquainted with the finances of the Society, I will make a statement as I think it due to you that a report should be made.

I will state that the Finance Committee on their organization took up all the papers of every character representing the expenses of last year, and audited them most carefully and fully, and found them correct; further, that with the assistance of the Secretary and Treasurer, the Finance Account is now in such a shape that the auditing for the present year is very simple. I will further state that the Committee has made it a point to meet regularly and audit the bills and to keep them in such a manner that they can be fully understood at all times; this could only be done by the full co-operation of the Secretary and Treasurer.

I will state that the bills which were outstanding, of which mention has been made at previous meetings, the number and amounts of which were unknown, have been obtained through the course of procedure of asking every person who receipted a bill to sign the bill in full. We think that all bills are now in, so that the Society is out of debt, which condition I think we have reason to congratulate this Society upon. Furthermore, the state of our Finances has been such that the publications of the Society were far in the background; at one time, nearly or quite ten

months; at the commencement of this year, I think, about five months; so that we have been obliged to work very carefully, and to husband expenses and proceed with caution, requiring a great deal of energy and watchfulness on the part of those who were entrusted with this matter; and I now congratulate the Society upon the fact that just before the Secretary started for this meeting, he mailed the last copies for the last month, so that we are up to date with our publications, which is, I think, a fact worthy of congratulation. It is a matter, too, which interests those more particularly who are not residents of New York, who are not present at the meetings of the Society. Those who are near can understand what is going on. The Finance Committee have felt, as well as the officers, that it was of the utmost importance that the member farthest distant should get the fullest information of the proceedings as promptly as possible, so as to make this Society national in its character, instead of a Society simply belonging to the City of New York.

I might go on with other matters, but think I have said enough. It has only been by the most industrious labor on the part of the Secretary and the Library Committee, whom you will perceive have had double and more work to do, that we have been enabled to reach this result. I hope you will receive this verbal report, and I will not occupy your time longer.

ANNOUNCEMENTS.

At the Meeting of the Society to be held August 6th, a paper by Max E. Schmidt, member of the Society, will be presented, subject, "The South Pass Jetties, Notes on the construction and durability of the works, with a description of the concrete blocks and other constructions of the last year." This paper will be put in print and will be discussed at the meeting of the Society to be held October 15th, 1879. Advance copies of the

paper will be sent to persons who will contribute discussion.

At the meeting of September 3d, a paper by William H. Searles, member of the Society, subject, "The Stability of Stone Structures," will be read and discussed. Advance copies of this paper will be sent to persons who desire to discuss the subject.

At the meeting of September 17th, a paper by James D. Burr, member of the Society,

subject, "The Construction of the A. T. and S. F. R. R., over the Baton Mountains," will be read and discussed. Advance copies of this paper will be sent to persons who desire to discuss the subject.

At the meeting of October 1st, the paper No. CLXXX (Transactions May 1879), on the Construction and Maintenance of Roads, by Edward P. North, member of the Society, and the discussions presented on the same at the Convention at Cleveland will be considered and further discussed. Advance copies of these discussions will be furnished to persons desiring to discuss the subject.

Discussion on each of these subjects is especially invited. The Secretary will forward the advance copies to those who inform him of their desire to discuss. The discussions may be presented verbally or sent to the Secretary, who will read them for the authors.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities, afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
ALLEN, CHARLES A.....City Engineer, Worcester, Mass....	June 4th, 1879.
BURDEN, JAMES A.....Burden Iron Works, Troy, N. Y.....	July 2d, "
DORSEY, EDWARD B.....261 Fifth Avenue, New York.....	June 4th, "
HASLETT, SULLIVAN.....115 Clinton st., Brooklyn, N. Y.....	" " "
MEIGS, MONTGOMERY.....U. S. Civil Eng., Rock Island, Ill....	March 5th, "
THOMPSON, WM. G. M.....Engineer in charge Welland Canal Enlargement, Welland Canal, On- tario, Canada.....	July 2d, "

FELLOW.

NORTON, FREDERICK O.....90 Broadway, New York..... June 4th, "

CHANGES AND CORRECTIONS.

MEMBERS.

- ENDICOTT, M. T. U. S. Navy Yard, Portsmouth, N. H.
 KENNEDY, WILLIAM H. Principal Asst. Engineer, Oregon Pacific Railroad,
 Walla Walla, Washington Territory.
 KINSLEY, THOMAS P. 508 Franklin ave., Brooklyn, N. Y.
 LOW, GORHAM P., Jr. Asst. Engineer Missouri River Bridge, Plattsmouth,
 Nebraska.
 MILLER, REUBEN. Crescent Steel Works, 81 Wood st., Pittsburgh, Pa.
 OPDYKE, STACY B., Jr. Engineer New Haven and Northampton, Co., 271
 Chapel st., New Haven, Conn.
 SMEDLEY, SAMUEL L. Chief Engineer and Surveyor of Philadelphia, East
 Entrance City Hall, Philadelphia, Pa.
 THATCHER, EDWIN. Keystone Bridge Co., Pittsburgh, Pa.
-

JUNIOR.

- TASKER, CHARLES A. Asst. Engineer, New York and Wood Haven Railroad,
 Wood Haven, Long Island, N. Y.
-

DECEASED.

- BELL, JAMES E. Elected Member March 5th, 1879. Died June 8th,
 1879.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, July, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

ELEVENTH ANNUAL CONVENTION OF THE SOCIETY.

FIRST SESSION.—The Eleventh Annual Convention was held at Cleveland, Ohio, beginning Tuesday June 17th, 1879. The Society met in the Council Chamber of the City which had been kindly offered for the purpose. The Secretary, John Bogart, called the Convention to order at 10 A. M. The chair was taken by Director and Past Vice-President, Theodore G. Ellis. The Hon. R. R. Herrick, Mayor of the City, then addressed the Convention as follows :

Gentlemen,—This is, as I am informed, the Eleventh Annual Convention of the American Association of Civil Engineers. I understand that there are representatives here from several countries of the American continent.

You have assembled from these different sections for one of the grandest purposes for which it is possible for men to meet together, and so intent upon the single object on which your thoughts are bent, you forget the difference of nationality, the difference of location and all the other differences which might tend to estrange one from the other and join hands, hearts and minds in the work of advancing that science and art whose function it is to utilize the forces and material of nature and cause them to subserve the general good.

You are to be congratulated upon choosing this city at this season of the year as the place of holding your convention. We possess broad streets and avenues, the beauties of some of which have a world-wide reputation. The charming effect of the combination of art with nature is here observed. The abundance of trees,

some of which are relics of the "forest primeval," and whose refreshing shade is now most grateful, has given us the name of the "Forest City." We have also our parks wherein are seen on a somewhat limited scale the product of one branch of engineering art, the efforts of your brethren in the craft to imitate nature. Upon our northern boundary we have an inland sea from off whose bosom fresh breezes almost continually blow "To fan our people cool" and on whose water sail many ships which bring to us much of our prosperity.

To our City, gentlemen, with all her attractions and her generous hospitality, of which I believe you will receive ample proof before your departure, you are most welcome.

Cleveland delights to receive within her boundaries such men as you. She is pleased to do honor to the students and practical demonstrators of that science which is doing more to develop the material resources of our country than all else besides. Your profession and the aims and objects of your gathering insures for you a most cordial greeting. We are fully aware of the relation which your profession sustains to the general development of our country. We know the vast scope which it comprehends and realize the debt of gratitude we owe to your predecessors and yourselves for our present advanced state of prosperity. We appreciate the great progress of the past sixty years, and know that the profession of engineering was the chief instrumentality in its accomplishment. Within that time it has covered our oceans, lakes and rivers with independent steamships, which ask no favors of the uncertain winds, but plow the waters, "pursuing the even tenor of their way" regardless of the quarter from which it blows. It has ditched the surface of the land for thousands of miles, thereby making canals for the safe and convenient transportation of merchandise. It has netted our country with railroads, arteries through which the life-blood of the nation continually flows. It has spanned our rivers and valleys with majestic viaducts and bridges. It has delved to the center of the earth and brought out the minerals which constitute the chief source of our wealth. It has tunnelled mountains and elevated valleys that the highway of trade might be made easy. It has constructed breakwaters and embankments, aqueducts, light-houses, docks, dams and sewers. All improvements small and great, incident to the growth of cities, States and nations are the products of its labors. As we traverse with ease and safety the viaduct that spans the valley, which lies between two sections of our own city, we appreciate the triumph of the engineering art and the skill and ability of our own townsmen, Strong, Morse and Miller, who have proven themselves "Masters of the situation." We gladly welcome their brethren in convention here assembled, and trust their sojourn with us may be both pleasant and profitable. It affords me pleasure in the name and behalf of the citizens of Cleveland to tender to you the freedom of the city.

The Chairman, Gen. T. G. Ellis, responded as follows :

Mr. Mayor—In the name of the American Society of Civil Engineers, allow me to return to you our sincere thanks for this cordial reception. The courtesies extended to us by the members of the Society residing in Cleveland, and by others of your citizens, as shown in the programme arranged by the local committee, are, let me assure you, highly appreciated. We shall return to our homes with our

hearts filled with pleasure by the kindness of our welcome, and our minds stored with knowledge by what we have seen.

Again let me thank you for our cordial welcome to your beautiful city.

Charles Paine, of Cleveland, was then chosen as Permanent Chairman of the Convention, and, on taking the chair, referred to the fact that while there were sixty civil engineers in Cleveland, that number represented only a fraction of the engineering talent concentrated there, it being in fact a city of mechanical engineers. All these members of our profession welcomed the Convention to the city with great enthusiasm, and had been so kind in the tender of invitations to visit the many points of engineering interest that the Committee had been much embarrassed in arranging the details for the few days at its disposal.

After referring to the geological position of the city and the programme prepared for excursions, he called the Convention to order to proceed to business.

John Bogart was then chosen to act as Secretary of the Convention. and George W. Dresser as Deputy Secretary.

The roll was then called, and the following members and guests were found in attendance.*

Members of the Society.—E. R. Andrews, Boston ; James Archbald, Scranton, Pa. ; Theodore Allen, St. Louis ; Geo. D. Ansley, Montreal ; W. H. Bradley, F. Brooks, Boston ; John W. Bacon, Danbury, Conn. ; H. D. Blunden, John Bogart, New York ; C. B. Brush, Hoboken, N. J. ; C. E. Broadhead, Hickory Run, Pa. ; E. N. Beebout, Canton, Ohio ; G. Bouscaren, Cincinnati ; W. R. Relknap, Louisville ; D. W. Cunningham, Grantville, Mass. ; J. P. Cotton, Newport, R. I. ; O. Chanute, F. Coltingwood, Theodore Cooper, New York ; W. B. Coffin, Elmira, N. Y. ; M. Coryell, Lambertville, N. J. ; E. S. Chesbrough, Chicago ; C. Constable, Rockwood, Tenn. ; George W. Dresser, New York ; Charles Davis, Alleghany City, Pa. ; C. Wheeler Durham, Chicago ; Fred. de Funiak, Louisville, Ky. ; S. C. Ellis, Boston ; C. D. Elliott, Somerville, Mass. ; Theo. G. Ellis, Hartford, Conn. ; Thomas Eggleston, C. E. Emery, New York ; H. Earnshaw, Cincinnati ; John E. Earley, Florence, Ala. ; E. A. Flint, Boston ; C. E. Fowler, New Haven, Conn. ; Clark Fisher, Trenton, N. J. ; Charles H. Fisher, Albany, N. Y. ; J. F. Flagg, Meadville, Pa. ; C. G. Force, Jr., Cleveland, Ohio ; H. Fladd, St. Louis ; B. Godwin, New York ; F. Graff, Philadelphia, A. Gottlieb, Pittsburgh, Pa. ; J. M. Goodwin, Sharpsville, Pa. ; Alex. Gordon, Hamilton, O. ; A. B. Hill, New Haven, Conn. ; R. Hering, Philadelphia ; J. E. Hilgard, Washington, D. C. ; J. W. Hill, Cincinnati ; J. H. Harlow, Pittsburgh, Pa. ; T. S. Hardee, B. M. Harrod, New Orleans, La. ; W. E. Kelley, New Brunswick, N. J. ; M. W. Kingsley, Cleveland ; John Kennedy, Montreal ; T. C. Keefer, Ottawa, Canada ; D. J. Lucas, Corry, Pa. ; Charles Latimer, Cleveland, O. ; T. D. Lovett, Winton Place, O. ; W.

* This list includes those who arrived at the Convention later.

H. Lotz, Chicago; Charles Macdonald, Geo. S. Morison, Chas. H. Myers, New York; D. N. Melvin, New Springville, Staten Island, N. Y.; J. R. Maxwell, Newark, Del.; D. E. McComb, Washington, D. C.; N. M. McDowell, Alleghany City, Pa.; Wm. Metcalf, Pittsburgh, Pa.; C. S. Maurice, Athens, Pa.; B. F. Morse, Cleveland, O.; W. E. Merrill, Cincinnati; W. F. Merrill, Peoria, Ill.; John MacLeod, Louisville, Ky.; E. P. North, F. O. Norton, New York; W. J. Nicolls, Baltimore; R. M. Newman, Jackson, Mich.; Alfred Noble, Detroit, Mich.; G. B. Nicholson, Cincinnati; W. H. Paine, New York; Charles Paine, Cleveland, O.; P. A. Peterson, Montreal; Wm. Rotch, Fall River, Mass.; Thomas Rodd, Pittsburgh, Pa.; R. L. Read, Cincinnati; H. B. Richardson, New Orleans; W. H. Searles, New York; E. Sweet, Jr., Albany, N. Y.; S. L. Smedley, Philadelphia; F. Slataper, Pittsburgh, Pa.; T. R. Scowden, S. Sheldon, C. H. Strong, Cleveland, O.; H. E. Stevens, St. Paul, Minn.; C. Shaler Smith, St. Louis; W. Sooy Smith, Maywood, Ill.; E. N. K. Talcott, Morgan Park, Ill.; E. B. Van Winkle, New York; F. O. Whitney, Boston; J. Whitney, Cambridge, Mass.; W. H. Wiley, W. E. Worthen, New York; J. Whitelaw, Cleveland, O.; H. F. Walling, Marietta, O.; F. C. Weir, Cincinnati; D. J. Whittemore, Milwaukee, Wis.; T. J. Whitman, St. Louis; S. Whinery, Wheeler, Ala.

VISITING ENGINEERS.—E. C. Appleton, Geo. H. Crafts, T. W. Davis, H. L. Eaton, F. L. Fuller, F. A. May, William Watson, Boston; E. S. Davis, Lowell, Mass.* H. Constable, L. M. Haupt, L. C. Madeira, Philadelphia;† Geo. H. Frost, New York; A. Wolcott, Chicago;‡ N. P. Bowler, C. F. Brush, Cleveland, O.; H. R. Bradbury, London, England; H. M. Claffen, J. D. Crehore, Cleveland, O.; D. Le Roy Dresser, New York; Jörgen Dahl, Christiana, Norway; G. Gender, Cleveland, O.; C. E. Greene, Ann Arbor, Mich.; F. Hind, Watertown, N. Y.; J. F. Hollaway, Cleveland, O.; Wm. Kent, Pittsburgh, Pa.; J. N. Knapp, Cleveland, O.; Thos. B. Lee, Newark, N. J.; M. D. Leggett, Cleveland, O.; F. A. Mahan, Pittsburgh, Pa.; A. G. Mordecai, Cleveland, O.; A. Meriwether, M. Meriwether, Memphis, Tenn.; M. W. Niven, Hoboken, N. J.; A. H. Porter, M. E. Rawson, W. P. Rice, Cleveland, O.; E. A. Rudiger, St. Marys, O.; E. H. Talbott, Chicago; J. Wainwright, A. M. Wellington, M. C. Younglove, Cleveland, O.

On motion, the following Committee was appointed to determine the order of presentation of papers and of discussions: O. Chanute, of New York, W. E. Merrill, of Cincinnati, John Kennedy, of Montreal.

A communication was presented from the Union Club of Cleveland, tendering a reception on the evening of June 19th. On motion, this invitation was accepted.

* Members Boston Society Civil Engineers.

† Members Engineers Club of Philadelphia.

‡ Members Engineers Club of the Northwest.

A paper by E. Sweet, Jr., subject: "The Engineering problems involved in the proposed improvement of the Erie Canal, by increasing the depth of its channel one foot;" was read by the author, and discussed by C. H. Fisher, Theodore Allen, William Watson, G. Bouscaren and the author.

A paper by Alfred Noble, subject: "Experiments with appliances for testing cement," was read by the author, and the subject was discussed by D. J. Whittemore, F. Collingwood, W. Sooy Smith, D. W. Cunningham, J. H. Harlow, C. Latimer, F. O. Norton, A. Noble, and, by letter, F. Rinecker.

SECOND SESSION.—The Convention resumed its session at 8 P. M.

Professor C. F. Brush made an address upon the electric light, which was illustrated by the stereopticon.

A paper, by C. G. Force, Jr., subject: "Design and Construction Table for Egg-shaped sewers," was read by the author, and illustrated by the Stereopticon.

A graphic chart, systematically showing the accounts of a railway, was presented, illustrated by the Stereopticon and explained by Charles Latimer.

A paper, by Charles Macdonald, subject: "The Construction of the Ocean Pier at Coney Island," was presented, illustrated by the Stereopticon, and read by the author. It was discussed by C. Shaler Smith, J. Whitelaw, G. W. Dresser, C. B. Brush, and the author.

The specifications for the Glasgow Steel Bridge were then read by the author, W. Sooy Smith, and discussed by W. H. Paine, G. Bouscaren, A. Gottlieb, Wm. Kent, C. Macdonald, W. Metcalf, C. G. Force, F. Collingwood, and the author.

THIRD SESSION.—The Convention resumed its session at 10 A. M., Wednesday, June 18th.

The Committee to determine the order of presentation of papers and of discussions, submitted the following resolutions, which were adopted:

Resolved, that in order to expedite business, each speaker be limited to ten minutes, unless by consent of the Convention.

Resolved, that discussions on published papers shall take precedence of new papers, so far as practicable.

A paper by Charles E. Emery, subject: "Flexure and Transverse Resistance of Beams," was read by the author, and discussed by William Kent.

A paper, by F. Collingwood, describing the progress of the work on the New York and Brooklyn Bridge, was read by the author.

A discussion of the published papers on the subject of the relative quantities of material in Bridges of different kinds of various heights, was presented by Charles E. Emery.

The published papers on the subject of the theoretical resistance of railroad curves, were discussed by J. F. Flagg, S. Whinery, and W. H. Searles.

The published paper by Edward P. North, subject: "The Construction and Maintenance of Roads," was discussed by Charles B. Brush, C. Shaler Smith, G. Bouscaren, E. B. Van Winkle, and by letters, F. Lavoinne, of Auxerre, France; F. Rinecker, of Wurzburg, Germany; and Charles Douglas Fox, of London, England.

FOURTH SESSION.—The regular meeting of the Society was held Wednesday evening, June 18th (see page 30 *ante*). At the close of the regular meeting the Convention resumed its session and proceeded to the business prescribed by Section 24 of the By-Laws: "At the Annual Convention a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention."

Nominations were made, and a ballot being taken, the following members were appointed by the Convention as the Nominating Committee:

Thomas S. Hardee, of New Orleans, La.; Thomas C. Keefer, of Ottawa, Canada; Charles Paine, of Cleveland, Ohio; Thomas J. Whitman of St. Louis, Mo.; Joseph P. Davis, of Boston, Mass.

On motion of W. E. Merrill, the following resolution was adopted:

Resolved, that the President of the Society be requested to establish such relations with the authorities at Washington, who print public documents as will enable the members of this Society to procure engineering documents on the best terms.

FIFTH SESSION.—The Convention resumed its session at 10 A. M., Thursday, June 19th.

The discussion of the published paper on the construction and maintenance of roads was resumed and continued by D. E. McComb, E. R. Andrews, C. Shaler Smith, G. Bouscaren, G. D. Ansley, E. S. Cheshbrough, A. B. Hill, J. E. Hilgard, H. Flad, M. Merriwether, B. F. Morse and the author, E. P. North.

The published paper by John Bogart, subject, "The permanent way of railways in Great Britain and Ireland, with special reference to the use of timber preserved and unpreserved," was discussed in a paper read by E. R. Andrews, and the subject further discussed by C. Latmer, E. Sweet, Jr., Wm. Watson, T. Egleston, C. Paine, J. Kennedy and, by letter, E. W. Bowditch.

On motion, it was

Resolved, that the Convention recommend the appointment of a Standing Committee on the Preservation of Timber. (See Proceedings, page 31 *ante*.)

A discussion of the published papers on the subject, "Brick Arches for Large Sewers," was presented in a letter from C. Herschel, and the subject further discussed by R. Hering.

The published paper by James B. Francis, subject, "The distribution of rain fall during the great storm of October, 1869," was discussed by W. Rotch.

The subject of a comparison of Standard Measures, English, French and United States was presented by abstracts from a paper by A. S. C. Wurtele and discussed by J. E. Hilgard, T. G. Ellis and C. Latimer.

The published paper by John W. Hill, subject, "Cushioning the reciprocating parts of Steam Engines," was discussed by C. E. Emery and the author, J. W. Hill.

The published paper by D. McN. Stauffer, subject, "The use of compressed air in Tubular foundations and its application at South Street Bridge, Philadelphia," was discussed by F. Collingwood.

The published papers by R. Hering, subject, "The Flow of Water in Small Channels, after Ganguillet and Kutter," was discussed in a paper, sent with a letter, by C. H. Swan, and further discussed by R. Hering.

A paper by John Kennedy, subject, "The Improvement of the St. Lawrence River," was read by the author.

The following unpublished papers were presented during the Convention, but not read on account of the want of time after the conclusion of the discussions on published papers :

Brazil, its Railways and Water Communications, W. Milnor Roberts.

The South Pass Jetties—the consolidation and durability of the works, with description of the Concrete Blocks and other constructions of the past year. Max E. Schmidt.

Discussion on the South Pass Jetties. H. D. Whitcomb.

Notes as to Construction and Operation of the Railroad over the Raton Mountains, Col., and the Construction and Performance of the Locomotives thereon. James D. Burr.

The Flow of Water in Rivers. De Volson Wood.

Stability of Stone Structures. Wm. H. Searles.

Wind Pressure. F. Collingwood.

Cadastral Maps in Ohio. H. F. Walling.

Additional notes on the Submarine Telephone. Chas. W. Raymond.

The following resolutions were adopted :

Resolved, that the Convention desires to express its hearty appreciation of and thanks for the great kindness, attention and forethought of the Local Committee in making preparations and carrying out the many details of arrangements for this Convention.

Resolved, that the warmest thanks of this Convention be tendered to the Mayor and other authorities of the City of Cleveland, to its citizens and to the city press, as well as to the various manufacturing and other establishments which we have visited, for their kind attentions and hospitality, which have made this Convention one of the pleasantest and most successful which the Society has ever held.

Resolved, that the thanks of the Convention be extended to Mr. Charles Paine for the able and courteous manner in which he has presided over its deliberations.

Resolved, that the thanks of the Convention be extended to the Managers of Railways and other lines of Transportation who have extended facilities for enabling the members to visit the Convention and return to their homes.

Resolved, that the thanks of the Convention are extended to the Committee which has so well discharged its duties in preparing and presenting the report regarding the Paris Exposition and our exhibits there.

Adjourned.

Very complete arrangements were made by the Local Committee for the time occupied in the regular sessions above reported. The visits to the many points of engineering interest in Cleveland and its immediate vicinity were so managed as to give to the members of the Society and their guests quite as full information in regard to the many industrial and mechanical works of the city as the time allowed. The excursions after the close of the Convention were also of great interest, and were fully enjoyed.

The members of the Cleveland Local Committee were: Charles Paine, Chairman; S. Sheldon, Charles H. Strong, T. R. Scowden, John Whitelaw, E. T. Scovill, Charles Latimer, B. F. Morse, J. Newell, M. W. Kingsley; C. G. Force, Jr., Sec'y and Treas.

The general programme for each day was printed in pocket form, with a monogram of the Society on the cover. It was distributed to members and guests, and was as follows:

AMERICAN SOCIETY OF CIVIL ENGINEERS.

ELEVENTH ANNUAL CONVENTION.

The headquarters of the Society will be at the Forest City House, Monumental Park. The Meetings of the Society will be held in the City Council Chamber, City Hall, on Superior Street, East of the Park, three minutes' walk from the Society headquarters. Take the elevator in the main entrance, City Hall. By the courtesy of the City Council the Council Chamber is placed at the disposal of the Society.

The Local Committee on Convention request each member and invited guest to call at the rooms of the Committee at headquarters immediately on arrival.

The members are requested, as soon as possible after their arrival, to signify to the Secretary which of the Excursions he proposes to join, and whether accompanied by ladies.

Ladies accompanying Members and Guests are invited to join all the Excursions, except on Wednesday afternoon.

TUESDAY, JUNE 17.

Convention will be called to order at 10 A. M. Hon. R. R. Herrick, Mayor of Cleveland, will welcome the Society in behalf of the citizens of Cleveland. Session. Adjournment. Dinner.

In the afternoon, leaving the hotel at 2 o'clock, an excursion in charge of Mr. B. F. Morse, City Civil Engineer, will be made to the Cleveland Viaduct; thence to the Reservoir and Pumping Works of the Cleveland Water Works; at this point the party will be in charge of Mr. John Whitelaw, Chief Engineer of the Water Works Department. Returning, will visit the Telegraph Supply Company's Works, Nos. 145 and 147 St. Clair street. Here the party will be in charge of Hon. M. D. Leggett, President of the Company, assisted by Professor Charles T. Brush, the inventor of the Brush Electric Lamp and the Brush Dynamo-Electric Machine. Prof. Brush will have a machine taken apart and one in operation, and will explain the working of his apparatus.

The excursion will end with a drive to the Union Steel Screw Company's Works, by the way of Euclid avenue. Here the party will be in charge of Mr. J. A. Bidwell, Superintendent of the Works. Returning, will visit the private grounds of J. H. Wade, Esq., owner of Euclid and Case avenues, thence by the way of Prospect street to the hotel.

At 7:45 p. m., the regular Society Meeting, to which the public is invited. The acting President of the Society will deliver an address, giving a summary of Engineering progress during the preceding years.

WEDNESDAY, JUNE 18.

Mr. Charles H. Strong, Manager of the Day.

The Convention will be called to order at 10 A. M. Session. Adjournment—Dinner.

In the afternoon there will be an excursion to some of the manufacturing establishments of the city, by way of the Cleveland & Pittsburg and Atlantic & Great Western Railroads. Special train will leave the Union Passenger Depot at 2 P. M., arriving at the Otis Iron and Steel Company's Works at 2:05. Here the party will be in charge of Hon. Charles A. Otis, President of the Otis Iron and Steel Company. Leaving at 2:25, will arrive at the St. Clair Street Crossing 2:28; from here Mr. H. M. Claffin, President of the Cleveland Bridge and Car Works, will escort the party to the works of that company; thence in charge of Mr. Zenas King, President of the King Iron Bridge and Manufacturing Company, to the works of this company, making a short stop at the Novelty Iron Works, Thomas R. Reeves, President. Leave St. Clair Street Crossing at 3; arrive at the Cleveland Rolling Mill Co.'s Works at 3:20. Here the party will be in charge of Mr. Henry Chisholm, President of the company, assisted by Mr. Willson Chisholm, Superintendent of the Newburgh Works. Thence by way of the A. & G. W. R. R., special train, leaving at 4:35, will arrive at the works of the Standard Oil Co. at 4:50. Here the party will be met by Mr. A. M. McGregor, Superintendent of the

Manufacturing Department of the Standard Oil Co., assisted by Mr. W. P. Cowen, Superintendent of the company's works at Cleveland.

Leaving the Standard Oil Co.'s Works at 6:00, will arrive at the Union Passenger Depot at 6:30, and at the hotel at 6:50.

By the courtesy of the officers of the C. & P. and the A. & G. W. R. R.'s, special trains will be run for the accommodation of the excursion party.

The locomotive whistle will be sounded five minutes before leaving each stopping point.

During the stay at the various points the movements of the party will be directed by the Manager of the Day, giving his signal with a policeman's whistle.

By invitation of Miss Sarah E. Fitch, President of the Women's Christian Association, an opportunity will be given the ladies to visit some of the benevolent institutions of the city. Carriages will be in waiting at the hotel at 2:30 P. M.

Session and business meeting at 7:45 P. M.

THURSDAY, JUNE 19.

There will be a social meeting of the Society at 10 A. M., at the City Council Chamber.

Two excursions have been provided for this afternoon.

Excursion on the lake. *John Whitelaw, manager.*

By the courtesy of Captain L. A. Pierce, agent of the Michigan Central R. R. Line of Steamers, there will be an excursion on the steamer *City of Detroit*, Captain William McKay. Invitations have been extended to members of the profession and others to join this excursion accompanied by ladies.

Members joining this excursion will leave the hotel at 1:45 P. M. in carriages, arriving at wharf No. 23 East River street 1:55. The boat leaves at 2 P. M., returning at 5 P. M. On the way out the steamer will sail around the Water Works Crib, and if the weather is favorable an opportunity will be given by those who wish to land and examine the work.

Excursion to Berea and Amherst Stone Quarries. *Charles Paine, manager.*

Those who wish to visit these stone quarries will leave the hotel at 2 P. M., and the Union Depot at 2:15 P. M., thence by way of the C. C. C. & I. Railway; will arrive at Berea at 2:45 P. M., change to open cars and go into the Berea Quarries, under the guidance of Mr. Frank Ford, Chief Engineer, C. C. C. & I. Railway. Returning to Berea Station at 3:45 P. M., take excursion coaches and proceed to Amherst Quarries. Returning by way of L. S. & M. S. R. R., will leave Amherst at 6 P. M., and arrive at the Union Depot at 7 P. M.

By the courtesy of the officers of the C. C. C. & I. and the L. S. & M. S. R. R., a special train will be run for the accommodation of the party.

RECEPTION.

The Union Club of Cleveland, S. L. Mather, President, has tendered a reception to the Society and its invited guests, at the Club House, No. 417 Euclid avenue, about five minutes' walk from the headquarters, Thursday evening, June 19, commencing at 8 o'clock. Those wishing to ride can take the Prospect street cars in front of the hotel direct to the entrance on Euclid avenue.

FRIDAY, JUNE 20.

Charles Latimer, Manager of the Day.

On this day an excursion will be made to the Mahoning Valley coal fields. The party will leave the hotel in carriages at 7:40 A. M., and the Atlantic & Great Western depot at 8 A. M.; arrive at Leavittsburgh at 9:20 A. M.; here a car hoist and transfer may be witnessed. Leave Leavittsburgh at 9:40 A. M.; arrive at Vienna Junction at 10:15 A. M., and arrive at Church Hill coal mines at 10:25 A. M. Here the party will be in charge of Mr. John Tod, President of the Coal Company of Tod, Morris & Co. Leave Church Hill at 11:25 A. M.; arrive at Youngstown at 11:45 A. M.; headquarters at the Tod House. The citizens of Youngstown have provided dinners for the party and carriages for drives to points of interest in Youngstown and vicinity during the afternoon.

During the stay in Youngstown Mr. Robert McCurdy and Mr. Chauncy Andrews will direct the movements of the party. Returning, will leave Youngstown at 4:50 P. M. Arrive at Cleveland at 7:15 P. M.

The excursion train will be under the direction of J. M. Ferris, Superintendent of the M. D. of the A. & G. W. R. R.

BRADFORD OIL DISTRICT.

Members not desiring to go into the Mahoning Valley Coal Fields may take the 7:10 A. M. express on the A. & G. W. R. R., arriving at Bradford at 5:15 P. M. Leaving Bradford at 2:20 P. M. on the next day, can connect with the main line going east at 3 P. M. For the west leave Bradford at 10 A. M. and make close connections, or at 4 P. M. and connect with the main line at 11:39 P. M.

NIAGARA FALLS.

Arrangements have been made, by which eastern members and others wishing to visit the Falls, may leave Cleveland on any of the regular trains, connecting at Buffalo for Niagara Falls.

A large party left Cleveland, as arranged by the above programme, for the Mahoning Valley Coal Fields, where a descent was made into the Great Church Hill Mine. Youngstown was then visited, and industrial works of much engineering interest examined. The Society and its guests were hospitably entertained by a committee of the citizens of Youngstown. A number of the party then visited Niagara Falls.

Another party visited the Oil District at Bradford, Pa., where, under the kind guidance of Mr. Charles Newell, the operations of drilling and tubing oil wells, pumping oil, endeavoring to recover tools lost in the wells, etc., were inspected. The use of natural gas for heating and cooking was also observed.

On Monday morning, June 16th (the day previous to the Convention), a large number of the members of the Society and their guests, *en route* for Cleveland, arrived at Pittsburgh, Pa. Here they were met by the members resident in that city, and first visited the works at Davis Island, where a lock and system of movable dams is in course of construction

some of which are relics of the "forest primeval," and whose refreshing shade is now most grateful, has given us the name of the "Forest City." We have also our parks wherein are seen on a somewhat limited scale the product of one branch of engineering art, the efforts of your brethren in the craft to imitate nature. Upon our northern boundary we have an inland sea from off whose bosom fresh breezes almost continually blow "To fan our people cool" and on whose water sail many ships which bring to us much of our prosperity.

To our City, gentlemen, with all her attractions and her generous hospitality, of which I believe you will receive ample proof before your departure, you are most welcome.

Cleveland delights to receive within her boundaries such men as you. She is pleased to do honor to the students and practical demonstrators of that science which is doing more to develop the material resources of our country than all else besides. Your profession and the aims and objects of your gathering insures for you a most cordial greeting. We are fully aware of the relation which your profession sustains to the general development of our country. We know the vast scope which it comprehends and realize the debt of gratitude we owe to your predecessors and yourselves for our present advanced state of prosperity. We appreciate the great progress of the past sixty years, and know that the profession of engineering was the chief instrumentality in its accomplishment. Within that time it has covered our oceans, lakes and rivers with independent steamships, which ask no favors of the uncertain winds, but plow the waters, "pursuing the even tenor of their way" regardless of the quarter from which it blows. It has ditched the surface of the land for thousands of miles, thereby making canals for the safe and convenient transportation of merchandise. It has netted our country with railroads, arteries through which the life-blood of the nation continually flows. It has spanned our rivers and valleys with majestic viaducts and bridges. It has delved to the center of the earth and brought out the minerals which constitute the chief source of our wealth. It has tunnelled mountains and elevated valleys that the highway of trade might be made easy. It has constructed breakwaters and embankments, aqueducts, light-houses, docks, dams and sewers. All improvements small and great, incident to the growth of cities, States and nations are the products of its labors. As we traverse with ease and safety the viaduct that spans the valley, which lies between two sections of our own city, we appreciate the triumph of the engineering art and the skill and ability of our own townsmen, Strong, Morse and Miller, who have proven themselves "Masters of the situation." We gladly welcome their brethren in convention here assembled, and trust their sojourn with us may be both pleasant and profitable. It affords me pleasure in the name and behalf of the citizens of Cleveland to tender to you the freedom of the city.

The Chairman, Gen. T. G. Ellis, responded as follows :

Mr. Mayor—In the name of the American Society of Civil Engineers, allow me to return to you our sincere thanks for this cordial reception. The courtesies extended to us by the members of the Society residing in Cleveland, and by others of your citizens, as shown in the programme arranged by the local committee, are, let me assure you, highly appreciated. We shall return to our homes with our

hearts filled with pleasure by the kindness of our welcome, and our minds stored with knowledge by what we have seen.

Again let me thank you for our cordial welcome to your beautiful city.

Charles Paine, of Cleveland, was then chosen as Permanent Chairman of the Convention, and, on taking the chair, referred to the fact that while there were sixty civil engineers in Cleveland, that number represented only a fraction of the engineering talent concentrated there, it being in fact a city of mechanical engineers. All these members of our profession welcomed the Convention to the city with great enthusiasm, and had been so kind in the tender of invitations to visit the many points of engineering interest that the Committee had been much embarrassed in arranging the details for the few days at its disposal.

After referring to the geological position of the city and the programme prepared for excursions, he called the Convention to order to proceed to business.

John Bogart was then chosen to act as Secretary of the Convention. and George W. Dresser as Deputy Secretary.

The roll was then called, and the following members and guests were found in attendance.*

Members of the Society.—E. R. Andrews, Boston ; James Archbald, Scranton, Pa. ; Theodore Allen, St. Louis ; Geo. D. Ansley, Montreal ; W. H. Bradley, F. Brooks, Boston ; John W. Bacon, Danbury, Conn. ; H. D. Blunden, John Bogart, New York ; C. B. Brush, Hoboken, N. J. ; C. E. Broadhead, Hickory Run, Pa. ; E. N. Beebout, Canton, Ohio ; G. Bouscaren, Cincinnati ; W. R. Relknap, Louisville ; D. W. Cunningham, Grantville, Mass. ; J. P. Cotton, Newport, R. I. ; O. Chanute, F. Collingwood, Theodore Cooper, New York ; W. B. Coffin, Elmira, N. Y. ; M. Coryell, Lambertville, N. J. ; E. S. Chesbrough, Chicago ; C. Constable, Rockwood, Tenn. ; George W. Dresser, New York ; Charles Davis, Alleghany City, Pa. ; C. Wheeler Durham, Chicago ; Fred. de Funiak, Louisville, Ky. ; S. C. Ellis, Boston ; C. D. Elliott, Somerville, Mass. ; Theo. G. Ellis, Hartford, Conn. ; Thomas Egleston, C. E. Emery, New York ; H. Earnshaw, Cincinnati ; John E. Earley, Florence, Ala. ; E. A. Flint, Boston ; C. E. Fowler, New Haven, Conn. ; Clark Fisher, Trenton, N. J. ; Charles H. Fisher, Albany, N. Y. ; J. F. Flagg, Meadville, Pa. ; C. G. Force, Jr., Cleveland, Ohio ; H. Fladd, St. Louis ; B. Godwin, New York ; F. Graff, Philadelphia, A. Gottlieb, Pittsburgh, Pa. ; J. M. Goodwin, Sharpsville, Pa. ; Alex. Gordon, Hamilton, O. ; A. B. Hill, New Haven, Conn. ; R. Hering, Philadelphia ; J. E. Hilgard, Washington, D. C. ; J. W. Hill, Cincinnati ; J. H. Harlow, Pittsburgh, Pa. ; T. S. Hardee, B. M. Harrod, New Orleans, La. ; W. E. Kelley, New Brunswick, N. J. ; M. W. Kingsley, Cleveland ; John Kennedy, Montreal ; T. C. Keefer, Ottawa, Canada ; D. J. Lucas, Corry, Pa. ; Charles Latimer, Cleveland, O. ; T. D. Lovett, Winton Place, O. ; W.

* This list includes those who arrived at the Convention later.

ailroad companies to the requirements of the rules adopted by the Commissioners, but experience in Massachusetts indicates that such opposition will gradually yield, and the railroad companies will find it to be an advantage in the end.

Respectfully submitted.

WM. P. SHINN,
O. CHANUTE,
FRED. DE FUNIACK, } Committee.

APPENDIX.

RULES, ETC.

A meeting of the Committee of Railroad Commissioners and Railroad Accountants on "Uniform System of Accounts and Returns," appointed at the General Convention of Railroad Commissioners in November last, was held at the St. Nicholas Hotel, New York City, Thursday, April 24, 1879, as per call of the Chairman, Mr. Woodruff of Connecticut.

There were present of the Committee: Messrs. Woodruff of Connecticut, Carter of Virginia, Turner of Wisconsin, Railroad Commissioners; Messrs. Leland of Ohio, Shinn of Pennsylvania, Wilbur of Boston, Railroad Accountants; and J. H. Goodspeed, Secretary; also, by invitation, Gen. F. A. Walker, Railroad Commissioner of Connecticut, and Mr. George E. Towne, Accountant, of Boston.

On a general discussion of the matter before the Committee, it was unanimously voted,—

"That it is the sentiment of the Committee that the system of accounts and returns should include a showing in detail of the annual operation."

The following general rules, in regard to the manner of keeping accounts from which the returns are to be made, were discussed and adopted:

I.

All liabilities (including interest accrued on funded debt) shall be entered upon the books in the month when they are incurred without reference to date of payment.

II.

Expenses shall be charged each month with such supplies, materials, &c., as have been used during that month, without reference to the time when they were purchased or paid for.

III.

No expenditure shall be charged to property accounts, except it be for actual increase

in construction, equipments or other property, unless it is made on old work in such a way as to clearly increase the value of the property over and above the cost of renewing the original structures, &c.

In such cases, only the amount of increased cost shall be charged, and the amount allowed on account of the old work shall be stated.

IV.

Mileage of passenger and freight trains shall include only the miles shown to be run by distances between stations; allowances made to passenger or freight trains for switching, and all mileage of switching engines computed on a basis of ten miles per hour for the time of actual service, shall be stated separately.

V.

Season ticket passengers shall be computed on the basis of twelve (12) passengers per week for the time of each ticket.

VI.

Local traffic should include all passengers carried on local tickets, and all freight carried at local tariff or special local rates.

All other traffic shall be considered through.

The form of return upon which the reports are to be made to the Commissioners was taken up and decided upon, with the exception of the division of operating expenses.

A form of division of operating expenses was submitted by Mr. Towne, and the Secretary was instructed to send copies of the same, together with the rules and form adopted, to the different members of the Committee, asking them to take it under consideration for discussion and final decision at the next meeting of the Committee, to be held at the time of the General Convention of Railroad Commissioners in June next.

The form of return as adopted by the Committee is as follows:

GENERAL EXHIBIT.

Total income.....	.....
Total expense .....	.....
Net income .....	.....
Interest on funded debt.....	.....
" " unfunded debt.....	.....
Rentals.....	.....
Balance applicable to dividends.....	.....
Dividends declared (per cent.).....	.....
*Balance for the year.....	.....

Balance (profit and loss) last year.....
 (Add or deduct various entries made
 during the year not included above
 (specifying same).)

Balance (profit and loss) carried forward
 to next year.....

CHARGES AND CREDITS TO PROPERTY DURING THE YEAR.

Construction and equipment (specifying
 same).....
 Other charges (specifying same).....
 Total charges.....
 Property sold or reduced in value (speci-
 fying same).....
 Net addition (or reduction) for the year ..

ANALYSIS OF EARNINGS AND EXPENSES.

Earnings :

From local passengers.....
 Through
 Express and extra baggage.....
 Mails.....
 Other sources, passenger department ..
 Total earnings passenger department.....
 Local freight.....
 Through freight.....
 Other sources, freight department.....
 Total earnings, freight department.....
 Total transportation earnings.....
 Rents from use of road.....
 Income from other sources (specifying
 same).....

Total income from all sources....

EXPENSES.

(See form submitted.)

ASSETS AND LIABILITIES.

Assets :

Construction account.....
 Equipment "
 (Locomotives, No.)
 (Parlor and sleeping cars, No.)
 (Passenger cars, No.)
 (Baggage and mail cars, No.)
 (Freight cars, No.)
 (Other cars, No.)
 Other investments (specifying same).....
 Cash items :
 Cash
 Bills receivable.....
 Due from agents and companies
 Other assets :
 Materials and supplies

Sinking funds.....
 Debit balances.....

Total assets.....

Liabilities :

Capital stock (as specified below).....
 Funded debt (as detailed below).....
 Unfunded debt, as follows :
 Interest unpaid.....
 Dividends unpaid.....
 Notes payable.....
 Vouchers and accounts.....
 Other liabilities.....
 Profit and loss or income accounts.....

Total liabilities.....

PRESENT OR CONTINGENT LIABILITIES NOT IN- CLUDED IN BALANCE SHEET.

Bonds guaranteed by this company or a
 lien on its road (specifying same)....
 Overdue interest on same.....
 Other liabilities (specifying same).....

MILEAGE, TRAFFIC, ETC.

Mileage passenger trains.....
 Freight "
 Switching "
 Other "

Total train mileage.....

Miles run by passenger, mail, and baggage
 cars (north or east).....
 Miles run by passenger, mail, and baggage
 cars (south or west).....
 Miles run by freight cars (north or east)..
 " " " (south or west)..
 Number of season ticket passengers.....
 Number of local passengers (including
 season).....
 Number of through passengers.....
 Total number of passengers carried.....
 Mileage of local passengers (north or east)
 " " " (south or west)
 Mileage of through passengers (north or
 east).....
 Mileage of through passengers (south or
 west).....

Total passenger mileage....

Number tons local freight carried.....
 " " through " "

Total tons freight carried

Mileage of local tonnage (north or east)..
 " " " (south or west) ..

Mileage of through tonnage (north or east)
" " " (south or west)
Total freight mileage
Average weight of passenger trains
" number of cars in passenger trains
Average weight of freight trains
" number of cars in train
" " persons employed....
Length of road, branches, sidings, &c....
Names of officers and directors
Corporate name of company

OPERATING EXPENSES.

Salaries general officers and clerks
Law expenses
Insurance
Stationery and printing
Outside agencies and advertising
Contingencies
Repairs bridges (including culverts and cattle guards)
Repairs buildings
" fences, road crossings, and signs
Renewal rails

Renewal ties
Repairs roadway and track
" locomotives
Fuel
Water supply
Oil and waste
Locomotive service
Repairs passenger cars
Passenger train service
" " supplies
Mileage passenger cars
Repairs freight cars
Freight train service
" " supplies
Mileage freight cars
Telegraph expenses (maintenance and operating)
Damage and loss freight and baggage
" " property and cattle
Personal injuries
Agents and station service
Station supplies
Total operating expenses
Taxes
Total operating expenses and taxes

REPORT OF COMMITTEE ON TESTS OF AMERICAN IRON AND STEEL.

To the American Society of Civil Engineers :

Your Committee on Tests of American Iron and Steel begs leave to submit the following report: At the Annual Convention of the Society, held at the City of Chicago seven years ago, your Committee on Tests was created. By frequent reports, and by papers read before the Society, you have been kept fully advised of the efforts made by the committee to procure from Congress the necessary appropriations for carrying on the work of the United States Testing Board. You have also been informed of the scheme of investigations devised by the Board, and the progress made in such investigations. Two appropriations have been obtained, amounting in the aggregate to ninety-four thousand three hundred and ninety-six dollars and ninety-eight cents—the odd dollars and cents accruing by the addition of an unexpended balance to a round sum. The act making the last appropriation provides that when the money has been expended the Board shall cease to exist, and that the testing machine built under the direction of the Board, and for its use, shall be turned over to the Secre-

tary of War. As you are aware, the machine was but recently completed. By directions given the Board at the time of its organization, this machine has been erected at the Watertown Arsenal, situated at Watertown, Massachusetts. As soon as it is turned over to the Secretary of War it drops into the possession of the United States Ordnance Department, subject to this further provision of the act referred to, that parties desiring to have tests made can do so by paying for the same. The money will all be expended before the end of the present fiscal year, which closes June 30th, inst. At the end of this month, then, the machine will be turned over and the United States Testing Board will cease to exist. For seven years your committee has importuned Congress for the necessary appropriations, with such measure of success as has been reported to you. For four years the Board has labored under many difficulties to plan and carry forward the work confided to it. A plan of investigation, which has received the hearty approval of this Society and of eminent engineers throughout the world, has been arranged. Such investigations as

could be economically and effectively carried on without the use of the long delayed machine, have been faithfully prosecuted by some of the sub-committees of the Board, and as a foretaste of the valuable results anticipated by us all from the labors of the United States Testing Board reports have recently been made by these committees, which will at once become standard authority on the subjects treated. Our Society, the Testing Board, and the country at large, have compensation for the long delay in the completion of the testing machine, in its unprecedented excellence, now that it is done. The labors of the Board, but just begun, have yielded benefits worth many times the gross amounts of the money appropriated, and our Government has for future use by far the best testing machine in the world.

From time to time, during the last seven years, your committee has performed the distasteful duties which devolve upon the "third house" at Washington, not corruptly, but honestly and earnestly commending a most worthy object to the attention and support of the Government. In the performance of this work its members have willingly spent large sums of money in necessary expenses and much valuable time, glad of the opportunity to make this contribution to so important a branch of scientific inquiry. Many members of the Society, and some of the manufacturers of iron and steel, besides numerous scientific societies and institutions of learning, have aided the committee with their valuable influence. To all these your committee desire to return sincere thanks. And we desire to ask that you will overlook or forgive the shortcomings which have occurred in our efforts to perform the duties assigned to us.

Engineers throughout our country realize the urgent need of the knowledge which the tests proposed were designed to procure. The country at large realizes it and fully approves the appropriation of the public money for this beneficent purpose.

Appropriations have been obtained; the necessary machinery has been provided; the Board seemed well selected; the work was auspiciously begun, when a bolt shot from a sky that was already lowering when we held our convention in New Orleans, two years ago, struck the United States Testing Board, the pet child of our Society, dead.

If you cannot weep over its fall, picture to yourselves the tragedies which result from the ignorance which it was created to remove,

and think of the symmetry, strength and perfection of the structures which American engineers would have given to the world, aided by the knowledge which this effort was designed to procure.

Who, we ask the "American Society of Civil Engineers," are the rightful owners of the testing machine and other appliances procured with the people's money for the use of the United States Testing Board? If the people, then let it be retained in the service of the people to promote the common interests of the country and not be turned over to any single bureau or department of the Government specially skilled only in a particular line of inquiry.

The knowledge we so much desire and so sorely need, can only be obtained by a mixed Board of experts independent of the control of any particular governmental department, except so far as the honest expenditure of the money appropriated is concerned.

Now, what will our Society, with its membership of six hundred, distributed in every State and Territory of the United States, do in this matter? Have we the necessary power and influence to induce the Government to right the grievous wrong that it has done us? Or are we a mutual admiration society which meets periodically to air fine spun theories, in utter unconsciousness of the density of the ignorance that envelops us? If these questions are couched in language lacking grace or courtesy, the Society is asked to pardon the want, and to remember that the threatened failure of an effort earnestly prosecuted for seven years, is likely to provoke strong language.

Your committee respectfully recommends that a new committee be appointed, the Chairman of which should reside at or near Washington, and that a ten times more vigorous effort than any yet made by the Society be put forth to recover what has been lost by inattention. As engineers, and as a society, we owe it to the Committee and Board who have labored so long without pay, to procure the means and to make the tests. We owe it to our country and to the world, since the work had been so auspiciously begun, to see to it that it shall not be permitted to fall until the knowledge we so much need, and which is now just within our grasp, has been secured and thoroughly digested and prepared for common use.

WM. SOOY SMITH,
Chairman of Committee on Tests.

REPORT OF THE FINANCE COMMITTEE.

PRESENTED VERBALLY BY WILLIAM H. PAINE, CHAIRMAN.

I did not expect to make a report this evening, but being acquainted with the finances of the Society, I will make a statement as I think it due to you that a report should be made.

I will state that the Finance Committee on their organization took up all the papers of every character representing the expenses of last year, and audited them most carefully and fully, and found them correct; further, that with the assistance of the Secretary and Treasurer, the Finance Account is now in such a shape that the auditing for the present year is very simple. I will further state that the Committee has made it a point to meet regularly and audit the bills and to keep them in such a manner that they can be fully understood at all times; this could only be done by the full co-operation of the Secretary and Treasurer.

I will state that the bills which were outstanding, of which mention has been made at previous meetings, the number and amounts of which were unknown, have been obtained through the course of procedure of asking every person who receipted a bill to sign the bill in full. We think that all bills are now in, so that the Society is out of debt, which condition I think we have reason to congratulate this Society upon. Furthermore, the state of our Finances has been such that the publications of the Society were far in the background; at one time, nearly or quite ten

months; at the commencement of this year, I think, about five months; so that we have been obliged to work very carefully, and to husband expenses and proceed with caution, requiring a great deal of energy and watchfulness on the part of those who were entrusted with this matter; and I now congratulate the Society upon the fact that just before the Secretary started for this meeting, he mailed the last copies for the last month, so that we are up to date with our publications, which is, I think, a fact worthy of congratulation. It is a matter, too, which interests those more particularly who are not residents of New York, who are not present at the meetings of the Society. Those who are near can understand what is going on. The Finance Committee have felt, as well as the officers, that it was of the utmost importance that the member farthest distant should get the fullest information of the proceedings as promptly as possible, so as to make this Society national in its character, instead of a Society simply belonging to the City of New York.

I might go on with other matters, but think I have said enough. It has only been by the most industrious labor on the part of the Secretary and the Library Committee, whom you will perceive have had double and more work to do, that we have been enabled to reach this result. I hope you will receive this verbal report, and I will not occupy your time longer.

ANNOUNCEMENTS.

At the Meeting of the Society to be held August 6th, a paper by Max E. Schmidt, member of the Society, will be presented, subject, "The South Pass Jetties, Notes on the construction and durability of the works, with a description of the concrete blocks and other constructions of the last year." This paper will be put in print and will be discussed at the meeting of the Society to be held October 15th, 1879. Advance copies of the

paper will be sent to persons who will contribute discussion.

At the meeting of September 3d, a paper by William H. Searles, member of the Society, subject, "The Stability of Stone Structures," will be read and discussed. Advance copies of this paper will be sent to persons who desire to discuss the subject.

At the meeting of September 17th, a paper by James D. Burr, member of the Society,

subject, "The Construction of the A. T. and S. F. R. R., over the Baton Mountains," will be read and discussed. Advance copies of this paper will be sent to persons who desire to discuss the subject.

At the meeting of October 1st, the paper No. CLXXX (Transactions May 1879), on the Construction and Maintenance of Roads, by Edward P. North, member of the Society, and the discussions presented on the same at the Convention at Cleveland will be considered and further discussed. Advance copies of these discussions will be furnished to persons desiring to discuss the subject.

Discussion on each of these subjects is especially invited. The Secretary will forward the advance copies to those who inform him of their desire to discuss. The discussions may be presented verbally or sent to the Secretary, who will read them for the authors.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities, afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
ALLEN, CHARLES A.....City Engineer, Worcester, Mass....	June 4th, 1879.
BURDEN, JAMES A.....Burden Iron Works, Troy, N. Y....	July 2d, "
DORSEY, EDWARD B.....261 Fifth Avenue, New York.....	June 4th, "
HASLETT, SULLIVAN.....115 Clinton st., Brooklyn, N. Y.....	" " "
MEIGS, MONTGOMERY.....U. S. Civil Eng., Rock Island, Ill... March 5th, "	
THOMPSON, WM. G. M.....Engineer in charge Welland Canal Enlargement, Welland Canal, Ontario, Canada.....	July 2d, "

FELLOW.

NORTON, FREDERICK O.....90 Broadway, New York.....	June 4th, "
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CHANGES AND CORRECTIONS.

MEMBERS.

- ENDICOTT, M. T. U. S. Navy Yard, Portsmouth, N. H.
 KENNEDY, WILLIAM H. Principal Asst. Engineer, Oregon Pacific Railroad,
 Walla Walla, Washington Territory.
 KINSLEY, THOMAS P. 508 Franklin ave., Brooklyn, N. Y.
 LOW, GORHAM P., Jr. Asst. Engineer Missouri River Bridge, Plattsmouth,
 Nebraska.
 MILLER, REUBEN. Crescent Steel Works, 81 Wood st., Pittsburgh, Pa.
 OPDYKE, STACY B., Jr. Engineer New Haven and Northampton, Co., 271
 Chapel st., New Haven, Conn.
 SMEDLEY, SAMUEL L. Chief Engineer and Surveyor of Philadelphia, East
 Entrance City Hall, Philadelphia, Pa.
 THATCHER, EDWIN. Keystone Bridge Co., Pittsburgh, Pa.
-

JUNIOR.

- TASKER, CHARLES A. Asst. Engineer, New York and Wood Haven Railroad,
 Wood Haven, Long Island, N. Y.
-

DECEASED.

- BELL, JAMES E. Elected Member March 5th, 1879. Died June 8th,
 1879.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, July, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

ELEVENTH ANNUAL CONVENTION OF THE SOCIETY.

FIRST SESSION.—The Eleventh Annual Convention was held at Cleveland, Ohio, beginning Tuesday June 17th, 1879. The Society met in the Council Chamber of the City which had been kindly offered for the purpose. The Secretary, John Bogart, called the Convention to order at 10 A. M. The chair was taken by Director and Past Vice-President, Theodore G. Ellis. The Hon. R. R. Herrick, Mayor of the City, then addressed the Convention as follows :

Gentlemen,—This is, as I am informed, the Eleventh Annual Convention of the American Association of Civil Engineers. I understand that there are representatives here from several countries of the American continent.

You have assembled from these different sections for one of the grandest purposes for which it is possible for men to meet together, and so intent upon the single object on which your thoughts are bent, you forget the difference of nationality, the difference of location and all the other differences which might tend to estrange one from the other and join hands, hearts and minds in the work of advancing that science and art whose function it is to utilize the forces and material of nature and cause them to subserve the general good.

You are to be congratulated upon choosing this city at this season of the year as the place of holding your convention. We possess broad streets and avenues, the beauties of some of which have a world-wide reputation. The charming effect of the combination of art with nature is here observed. The abundance of trees,

some of which are relics of the "forest primeval," and whose refreshing shade is now most grateful, has given us the name of the "Forest City." We have also our parks wherein are seen on a somewhat limited scale the product of one branch of engineering art, the efforts of your brethren in the craft to imitate nature. Upon our northern boundary we have an inland sea from off whose bosom fresh breezes almost continually blow "To fan our people cool" and on whose water sail many ships which bring to us much of our prosperity.

To our City, gentlemen, with all her attractions and her generous hospitality, of which I believe you will receive ample proof before your departure, you are most welcome.

Cleveland delights to receive within her boundaries such men as you. She is pleased to do honor to the students and practical demonstrators of that science which is doing more to develop the material resources of our country than all else besides. Your profession and the aims and objects of your gathering insures for you a most cordial greeting. We are fully aware of the relation which your profession sustains to the general development of our country. We know the vast scope which it comprehends and realize the debt of gratitude we owe to your predecessors and yourselves for our present advanced state of prosperity. We appreciate the great progress of the past sixty years, and know that the profession of engineering was the chief instrumentality in its accomplishment. Within that time it has covered our oceans, lakes and rivers with independent steamships, which ask no favors of the uncertain winds, but plow the waters, "pursuing the even tenor of their way" regardless of the quarter from which it blows. It has ditched the surface of the land for thousands of miles, thereby making canals for the safe and convenient transportation of merchandise. It has netted our country with railroads, arteries through which the life-blood of the nation continually flows. It has spanned our rivers and valleys with majestic viaducts and bridges. It has delved to the center of the earth and brought out the minerals which constitute the chief source of our wealth. It has tunnelled mountains and elevated valleys that the highway of trade might be made easy. It has constructed breakwaters and embankments, aqueducts, light-houses, docks, dams and sewers. All improvements small and great, incident to the growth of cities, States and nations are the products of its labors. As we traverse with ease and safety the viaduct that spans the valley, which lies between two sections of our own city, we appreciate the triumph of the engineering art and the skill and ability of our own townsmen, Strong, Morse and Miller, who have proven themselves "Masters of the situation." We gladly welcome their brethren in convention here assembled, and trust their sojourn with us may be both pleasant and profitable. It affords me pleasure in the name and behalf of the citizens of Cleveland to tender to you the freedom of the city.

The Chairman, Gen. T. G. Ellis, responded as follows :

Mr. Mayor—In the name of the American Society of Civil Engineers, allow me to return to you our sincere thanks for this cordial reception. The courtesies extended to us by the members of the Society residing in Cleveland, and by others of your citizens, as shown in the programme arranged by the local committee, are, let me assure you, highly appreciated. We shall return to our homes with our

hearts filled with pleasure by the kindness of our welcome, and our minds stored with knowledge by what we have seen.

Again let me thank you for our cordial welcome to your beautiful city.

Charles Paine, of Cleveland, was then chosen as Permanent Chairman of the Convention, and, on taking the chair, referred to the fact that while there were sixty civil engineers in Cleveland, that number represented only a fraction of the engineering talent concentrated there, it being in fact a city of mechanical engineers. All these members of our profession welcomed the Convention to the city with great enthusiasm, and had been so kind in the tender of invitations to visit the many points of engineering interest that the Committee had been much embarrassed in arranging the details for the few days at its disposal.

After referring to the geological position of the city and the programme prepared for excursions, he called the Convention to order to proceed to business.

John Bogart was then chosen to act as Secretary of the Convention, and George W. Dresser as Deputy Secretary.

The roll was then called, and the following members and guests were found in attendance.*

Members of the Society.—E. R. Andrews, Boston; James Archbald, Scranton, Pa.; Theodore Allen, St. Louis; Geo. D. Ansley, Montreal; W. H. Bradley, F. Brooks, Boston; John W. Bacon, Danbury, Conn.; H. D. Blunden, John Bogart, New York; C. B. Brush, Hoboken, N. J.; C. E. Broadhead, Hickory Run, Pa.; E. N. Beebont, Canton, Ohio; G. Bouscaren, Cincinnati; W. R. Relknap, Louisville; D. W. Cunningham, Grantville, Mass.; J. P. Cotton, Newport, R. I.; O. Chanute, F. Collingwood, Theodore Cooper, New York; W. B. Coffin, Elmira, N. Y.; M. Coryell, Lambertville, N. J.; E. S. Chesbrough, Chicago; C. Constable, Rockwood, Tenn.; George W. Dresser, New York; Charles Davis, Alleghany City, Pa.; C. Wheeler Durham, Chicago; Fred. de Funiak, Louisville, Ky.; S. C. Ellis, Boston; C. D. Elliott, Somerville, Mass.; Theo. G. Ellis, Hartford, Conn.; Thomas Egleston, C. E. Emery, New York; H. Earnshaw, Cincinnati; John E. Earley, Florence, Ala.; E. A. Flint, Boston; C. E. Fowler, New Haven, Conn.; Clark Fisher, Trenton, N. J.; Charles H. Fisher, Albany, N. Y.; J. F. Flagg, Meadville, Pa.; C. G. Force, Jr., Cleveland, Ohio; H. Fladd, St. Louis; B. Godwin, New York; F. Graff, Philadelphia, A. Gottlieb, Pittsburgh, Pa.; J. M. Goodwin, Sharpsville, Pa.; Alex. Gordon, Hamilton, O.; A. B. Hill, New Haven, Conn.; R. Hering, Philadelphia; J. E. Hilgard, Washington, D. C.; J. W. Hill, Cincinnati; J. H. Harlow, Pittsburgh, Pa.; T. S. Hardee, B. M. Harrod, New Orleans, La.; W. E. Kelley, New Brunswick, N. J.; M. W. Kingsley, Cleveland; John Kennedy, Montreal; T. C. Keefer, Ottawa, Canada; D. J. Lucas, Corry, Pa.; Charles Latimer, Cleveland, O.; T. D. Lovett, Winton Place, O.; W.

* This list includes those who arrived at the Convention later.

H. Lotz, Chicago; Charles Macdonald, Geo. S. Morison, Chas. H. Myers, New York; D. N. Melvin, New Springville, Staten Island, N. Y.; J. R. Maxwell, Newark, Del.; D. E. McComb, Washington, D. C.; N. M. McDowell, Alleghany City, Pa.; Wm. Metcalf, Pittsburgh, Pa.; C. S. Maurice, Athens, Pa.; B. F. Morse, Cleveland, O.; W. E. Merrill, Cincinnati; W. F. Merrill, Peoria, Ill.; John MacLeod, Louisville, Ky.; E. P. North, F. O. Norton, New York; W. J. Nicolls, Baltimore; R. M. Newman, Jackson, Mich.; Alfred Noble, Detroit, Mich.; G. B. Nicholson, Cincinnati; W. H. Paine, New York; Charles Paine, Cleveland, O.; P. A. Peterson, Montreal; Wm. Rotch, Fall River, Mass.; Thomas Rodd, Pittsburgh, Pa.; R. L. Read, Cincinnati; H. B. Richardson, New Orleans; W. H. Searles, New York; E. Sweet, Jr., Albany, N. Y.; S. L. Smedley, Philadelphia; F. Slataper, Pittsburgh, Pa.; T. R. Scowden, S. Sheldon, C. H. Strong, Cleveland, O.; H. E. Stevens, St. Paul, Minn.; C. Shaler Smith, St. Louis; W. Sooy Smith, Maywood, Ill.; E. N. K. Talcott, Morgan Park, Ill.; E. B. Van Winkle, New York; F. O. Whitney, Boston; J. Whitney, Cambridge, Mass.; W. H. Wiley, W. E. Worthen, New York; J. Whitelaw, Cleveland, O.; H. F. Walling, Marietta, O.; F. C. Weir, Cincinnati; D. J. Whitemore, Milwaukee, Wis.; T. J. Whitman, St. Louis; S. Whinery, Wheeler, Ala.

VISITING ENGINEERS.—E. C. Appleton, Geo. H. Crafts, T. W. Davis, H. L. Eaton, F. L. Fuller, F. A. May, William Watson, Boston; E. S. Davis, Lowell, Mass.;* H. Constable, L. M. Haupt, L. C. Madeira, Philadelphia;† Geo. H. Frost, New York; A. Wolcott, Chicago;‡ N. P. Bowler, C. F. Brush, Cleveland, O.; H. R. Bradbury, London, England; H. M. Claflen, J. D. Crehore, Cleveland, O.; D. Le Roy Dresser, New York; Jörgen Dahl, Christiana, Norway; G. Geuder, Cleveland, O.; C. E. Greene, Ann Arbor, Mich.; F. Hind, Watertown, N. Y.; J. F. Hollaway, Cleveland, O.; Wm. Kent, Pittsburgh, Pa.; J. N. Knapp, Cleveland, O.; Thos. B. Lee, Newark, N. J.; M. D. Leggett, Cleveland, O.; F. A. Mahan, Pittsburgh, Pa.; A. G. Mordecai, Cleveland, O.; A. Meriwether, M. Meriwether, Memphis, Tenn.; M. W. Niven, Hoboken, N. J.; A. H. Porter, M. E. Rawson, W. P. Rice, Cleveland, O.; E. A. Rudiger, St. Marys, O.; E. H. Talbott, Chicago; J. Wainwright, A. M. Wellington, M. C. Youngloze, Cleveland, O.

On motion, the following Committee was appointed to determine the order of presentation of papers and of discussions: O. Chanute, of New York, W. E. Merrill, of Cincinnati, John Kennedy, of Montreal.

A communication was presented from the Union Club of Cleveland, tendering a reception on the evening of June 19th. On motion, this invitation was accepted.

* Members Boston Society Civil Engineers.

† Members Engineers Club of Philadelphia.

‡ Members Engineers Club of the Northwest.

A paper by E. Sweet, Jr., subject: "The Engineering problems involved in the proposed improvement of the Erie Canal, by increasing the depth of its channel one foot;" was read by the author, and discussed by C. H. Fisher, Theodore Allen, William Watson, G. Bouscaren and the author.

A paper by Alfred Noble, subject: "Experiments with appliances for testing cement," was read by the author, and the subject was discussed by D. J. Whittemore, F. Collingwood, W. Sooy Smith, D. W. Cunningham, J. H. Harlow, C. Latimer, F. O. Norton, A. Noble, and, by letter, F. Rinecker.

SECOND SESSION.—The Convention resumed its session at 8 p. m.

Professor C. F. Brush made an address upon the electric light, which was illustrated by the stereopticon.

A paper, by C. G. Force, Jr., subject: "Design and Construction Table for Egg-shaped sewers," was read by the author, and illustrated by the Stereopticon.

A graphic chart, systematically showing the accounts of a railway, was presented, illustrated by the Stereopticon and explained by Charles Latimer.

A paper, by Charles Macdonald, subject: "The Construction of the Ocean Pier at Coney Island," was presented, illustrated by the Stereopticon, and read by the author. It was discussed by C. Shaler Smith, J. Whitelaw, G. W. Dresser, C. B. Brush, and the author.

The specifications for the Glasgow Steel Bridge were then read by the author, W. Sooy Smith, and discussed by W. H. Paine, G. Bouscaren, A. Gottlieb, Wm. Kent, C. Macdonald, W. Metcalf, C. G. Force, F. Collingwood, and the author.

THIRD SESSION.—The Convention resumed its session at 10 a. m., Wednesday, June 18th.

The Committee to determine the order of presentation of papers and of discussions, submitted the following resolutions, which were adopted:

Resolved, that in order to expedite business, each speaker be limited to ten minutes, unless by consent of the Convention.

Resolved, that discussions on published papers shall take precedence of new papers, so far as practicable.

A paper by Charles E. Emery, subject: "Flexure and Transverse Resistance of Beams," was read by the author, and discussed by William Kent.

A paper, by F. Collingwood, describing the progress of the work on the New York and Brooklyn Bridge, was read by the author.

A discussion of the published papers on the subject of the relative quantities of material in Bridges of different kinds of various heights, was presented by Charles E. Emery.

The published papers on the subject of the theoretical resistance of railroad curves, were discussed by J. F. Flagg, S. Whinery, and W. H. Searles.

The published paper by Edward P. North, subject: "The Construction and Maintenance of Roads," was discussed by Charles B. Brush, C. Shaler Smith, G. Bouscaren, E. B. Van Winkle, and by letters, F. Lavoigne, of Auxerre, France; F. Rinecker, of Wurzburg, Germany; and Charles Douglas Fox, of London, England.

FOURTH SESSION.—The regular meeting of the Society was held Wednesday evening, June 18th (see page 30 *ante*). At the close of the regular meeting the Convention resumed its session and proceeded to the business prescribed by Section 24 of the By-Laws: "At the Annual Convention a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention."

Nominations were made, and a ballot being taken, the following members were appointed by the Convention as the Nominating Committee:

Thomas S. Hardee, of New Orleans, La.; Thomas C. Keefer, of Ottawa, Canada; Charles Paine, of Cleveland, Ohio; Thomas J. Whitman of St. Louis, Mo.; Joseph P. Davis, of Boston, Mass.

On motion of W. E. Merrill, the following resolution was adopted:

Resolved, that the President of the Society be requested to establish such relations with the authorities at Washington, who print public documents as will enable the members of this Society to procure engineering documents on the best terms.

FIFTH SESSION.—The Convention resumed its session at 10 A. M., Thursday, June 19th.

The discussion of the published paper on the construction and maintenance of roads was resumed and continued by D. E. McComb, E. R. Andrews, C. Shaler Smith, G. Bouscaren, G. D. Ansley, E. S. Cheshbrough, A. B. Hill, J. E. Hilgard, H. Flad, M. Merriwether, B. F. Morse and the author, E. P. North.

The published paper by John Bogart, subject, "The permanent way of railways in Great Britain and Ireland, with special reference to the use of timber preserved and unpreserved," was discussed in a paper read by E. R. Andrews, and the subject further discussed by C. Latmer, E. Sweet, Jr., Wm. Watson, T. Egleston, C. Paine, J. Kennedy and, by letter, E. W. Bowditch.

On motion, it was

Resolved, that the Convention recommend the appointment of a Standing Committee on the Preservation of Timber. (See Proceedings, page 31 *ante*.)

A discussion of the published papers on the subject, "Brick Arches for Large Sewers," was presented in a letter from C. Herschel, and the subject further discussed by R. Hering.

The published paper by James B. Francis, subject, "The distribution of rain fall during the great storm of October, 1869," was discussed by W. Rotch.

The subject of a comparison of Standard Measures, English, French and United States was presented by abstracts from a paper by A. S. C. Wurtele and discussed by J. E. Hilgard, T. G. Ellis and C. Latimer.

The published paper by John W. Hill, subject, "Cushioning the reciprocating parts of Steam Engines," was discussed by C. E. Emery and the author, J. W. Hill.

The published paper by D. McN. Stauffer, subject, "The use of compressed air in Tubular foundations and its application at South Street Bridge, Philadelphia," was discussed by F. Collingwood.

The published papers by R. Hering, subject, "The Flow of Water in Small Channels, after Ganguillet and Kutter," was discussed in a paper, sent with a letter, by C. H. Swan, and further discussed by R. Hering.

A paper by John Kennedy, subject, "The Improvement of the St. Lawrence River," was read by the author.

The following unpublished papers were presented during the Convention, but not read on account of the want of time after the conclusion of the discussions on published papers :

Brazil, its Railways and Water Communications, W. Milnor Roberts.

The South Pass Jetties—the consolidation and durability of the works, with description of the Concrete Blocks and other constructions of the past year. Max E. Schmidt.

Discussion on the South Pass Jetties. H. D. Whitcomb.

Notes as to Construction and Operation of the Railroad over the Raton Mountains, Col., and the Construction and Performance of the Locomotives thereon. James D. Burr.

The Flow of Water in Rivers. De Volson Wood.

Stability of Stone Structures. Wm. H. Searles.

Wind Pressure. F. Collingwood.

Cadastral Maps in Ohio. H. F. Walling.

Additional notes on the Submarine Telephone. Chas. W. Raymond.

The following resolutions were adopted :

Resolved, that the Convention desires to express its hearty appreciation of and thanks for the great kindness, attention and forethought of the Local Committee in making preparations and carrying out the many details of arrangements for this Convention.

Resolved, that the warmest thanks of this Convention be tendered to the Mayor and other authorities of the City of Cleveland, to its citizens and to the city press, as well as to the various manufacturing and other establishments which we have visited, for their kind attentions and hospitality, which have made this Convention one of the pleasantest and most successful which the Society has ever held.

Resolved, that the thanks of the Convention be extended to Mr. Charles Paine for the able and courteous manner in which he has presided over its deliberations.

Resolved, that the thanks of the Convention be extended to the Managers of Railways and other lines of Transportation who have extended facilities for enabling the members to visit the Convention and return to their homes.

Resolved, that the thanks of the Convention are extended to the Committee which has so well discharged its duties in preparing and presenting the report regarding the Paris Exposition and our exhibits there.

Adjourned.

Very complete arrangements were made by the Local Committee for the time occupied in the regular sessions above reported. The visits to the many points of engineering interest in Cleveland and its immediate vicinity were so managed as to give to the members of the Society and their guests quite as full information in regard to the many industrial and mechanical works of the city as the time allowed. The excursions after the close of the Convention were also of great interest, and were fully enjoyed.

The members of the Cleveland Local Committee were: Charles Paine, Chairman; S. Sheldon, Charles H. Strong, T. R. Scowden, John Whitelaw, E. T. Scovill, Charles Latimer, B. F. Morse, J. Newell, M. W. Kingsley; C. G. Force, Jr., Sec'y and Treas.

The general programme for each day was printed in pocket form, with a monogram of the Society on the cover. It was distributed to members and guests, and was as follows:

AMERICAN SOCIETY OF CIVIL ENGINEERS.

ELEVENTH ANNUAL CONVENTION.

The headquarters of the Society will be at the Forest City House, Monumental Park. The Meetings of the Society will be held in the City Council Chamber, City Hall, on Superior Street, East of the Park, three minutes' walk from the Society headquarters. Take the elevator in the main entrance, City Hall. By the courtesy of the City Council the Council Chamber is placed at the disposal of the Society.

The Local Committee on Convention request each member and invited guest to call at the rooms of the Committee at headquarters immediately on arrival.

The members are requested, as soon as possible after their arrival, to signify to the Secretary which of the Excursions he proposes to join, and whether accompanied by ladies.

Ladies accompanying Members and Guests are invited to join all the Excursions, except on Wednesday afternoon.

TUESDAY, JUNE 17.

Convention will be called to order at 10 A. M. Hon. R. R. Herrick, Mayor of Cleveland, will welcome the Society in behalf of the citizens of Cleveland. Session. Adjournment. Dinner.

In the afternoon, leaving the hotel at 2 o'clock, an excursion in charge of Mr. B. F. Morse, City Civil Engineer, will be made to the Cleveland Viaduct; thence to the Reservoir and Pumping Works of the Cleveland Water Works; at this point the party will be in charge of Mr. John Whitelaw, Chief Engineer of the Water Works Department. Returning, will visit the Telegraph Supply Company's Works, Nos. 145 and 147 St. Clair street. Here the party will be in charge of Hon. M. D. Leggett, President of the Company, assisted by Professor Charles T. Brush, the inventor of the Brush Electric Lamp and the Brush Dynamo-Electric Machine. Prof. Brush will have a machine taken apart and one in operation, and will explain the working of his apparatus.

The excursion will end with a drive to the Union Steel Screw Company's Works, by the way of Euclid avenue. Here the party will be in charge of Mr. J. A. Bidwell, Superintendent of the Works. Returning, will visit the private grounds of J. H. Wade, Esq., owner of Euclid and Case avenues, thence by the way of Prospect street to the hotel.

At 7:45 p. m., the regular Society Meeting, to which the public is invited. The acting President of the Society will deliver an address, giving a summary of Engineering progress during the preceding years.

WEDNESDAY, JUNE 18.

Mr. Charles H. Strong, Manager of the Day.

The Convention will be called to order at 10 A. M. Session. Adjournment—Dinner.

In the afternoon there will be an excursion to some of the manufacturing establishments of the city, by way of the Cleveland & Pittsburg and Atlantic & Great Western Railroads. Special train will leave the Union Passenger Depot at 2 P. M., arriving at the Otis Iron and Steel Company's Works at 2:05. Here the party will be in charge of Hon. Charles A. Otis, President of the Otis Iron and Steel Company. Leaving at 2:25, will arrive at the St. Clair Street Crossing 2:28; from here Mr. H. M. Clafin, President of the Cleveland Bridge and Car Works, will escort the party to the works of that company; thence in charge of Mr. Zenas King, President of the King Iron Bridge and Manufacturing Company, to the works of this company, making a short stop at the Novelty Iron Works, Thomas R. Reeves, President. Leave St. Clair Street Crossing at 3; arrive at the Cleveland Rolling Mill Co.'s Works at 3:20. Here the party will be in charge of Mr. Henry Chisholm, President of the company, assisted by Mr. Willson Chisholm, Superintendent of the Newburgh Works. Thence by way of the A. & G. W. R. R., special train, leaving at 4:35, will arrive at the works of the Standard Oil Co. at 4:50. Here the party will be met by Mr. A. M. McGregor, Superintendent of the

Resolved, that the thanks of the Convention be given to Charles Paine for the able and courteous manner in which he presided over its deliberations.

Resolved, that the thanks of the Convention be given to the Managers of Railways and other lines of Transportation for the extended facilities for enabling the members to visit and return to their homes.

Resolved, that the thanks of the Convention be given to the Committee which has so well discharged its duty in presenting the report regarding the Paris Exposition there.

Adjourned.

Very complete arrangements were made by the time occupied in the regular sessions about the many points of engineering interest in the vicinity were so managed as to give to the members and their guests quite as full information in regard to the electrical and mechanical works of the city as the time permitted after the close of the Convention were also fully enjoyed.

The members of the Cleveland Local Committee were: Charles Paine, Chairman; S. Sheldon, Charles I. John Whitelaw, E. T. Scovill, Charles I. M. W. Kingsley; C. G. Force, Jr., Secretary.

The general programme for each day was printed with a monogram of the Society on the cover for the members and guests, and was as follows:

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ELEVENTH ANNUAL CONVENTION

The headquarters of the Society will be at the Metropolitan Park. The Meetings of the Society will be held in the Chamber, City Hall, on Superior Street, from the Society headquarters, The City Hall. By the courtesy of the City of Cleveland the use of the City Hall is at the disposal of the Society.

The Local Committee on Convention will be at the rooms of the Committee on Convention, 417 Euclid Avenue, to call at the rooms of the Committee on Convention.

The members are requested, as far as possible, to be accompanied by ladies.

At 12 P. M.,
The L. S. & M. S. R. R. will leave
for the Breaux Quar-
ters, C. C. & I. Rail-
road coaches and pro-
vided by the L. S. & M. S. R. R., will leave
for the party.

The President, has tendered a recep-
tion at the Club House, No. 417 Euclid
Avenue, Thursday evening, June
1st. The party can take the Prospect street
car to Euclid Avenue.

by coal fields.
to & Great
ear hoist
arrive at
10:25 A. M.
al Company
Youngstown
ngstown have
of interest in

Mr. Chauncy An-
will leave Youngs-

rris, Superintendent

by Coal Fields may take
at Bradford at 5:15 P. M.
connect with the main line
10 A. M. and make close con-
at 11:39 P. M.

ern members and others wishing
the regular trains, connecting at

anged by the above programme,
where a descent was made into the
own was then visited, and industrial
rest examined. The Society and its
d by a committee of the citizens of
party then visited Niagara Falls.
District at Bradford, Pa., where, under
es Newell, the operations of drilling and
endeavoring to recover tools lost in the
The use of natural gas for heating and

the 16th (the day previous to the Convention),
members of the Society and their guests, *en route*
at Pittsburgh, Pa. Here they were met by the
that city, and first visited the works at Davis Island,
tem of movable dams is in course of construction

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The excursion will end with a drive to the Union Steel Screw Company's Works, by the way of Euclid avenue. Here the party will be in charge of Mr. J. A. Bidwell, Superintendent of the Works. Returning, will visit the private grounds of J. H. Wade, Esq., owner of Euclid and Case avenues, thence by the way of Prospect street to the hotel.

At 7:45 p. m., the regular Society Meeting, to which the public is invited. The acting President of the Society will deliver an address, giving a summary of Engineering progress during the preceding years.

WEDNESDAY, JUNE 18.

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Manufacturing Department of the Standard Oil Co., assisted by Mr. W. P. Cowen, Superintendent of the company's works at Cleveland.

Leaving the Standard Oil Co.'s Works at 6:00, will arrive at the Union Passenger Depot at 6:30, and at the hotel at 6:50.

By the courtesy of the officers of the C. & P. and the A. & G. W. R. R.'s, special trains will be run for the accommodation of the excursion party.

The locomotive whistle will be sounded five minutes before leaving each stopping point.

During the stay at the various points the movements of the party will be directed by the Manager of the Day, giving his signal with a policeman's whistle.

By invitation of Miss Sarah E. Fitch, President of the Women's Christian Association, an opportunity will be given the ladies to visit some of the benevolent institutions of the city. Carriages will be in waiting at the hotel at 2:30 P. M.

Session and business meeting at 7:45 P. M.

THURSDAY, JUNE 19.

There will be a social meeting of the Society at 10 A. M., at the City Council Chamber.

Two excursions have been provided for this afternoon.

Excursion on the lake. *John Whitelaw, manager.*

By the courtesy of Captain L. A. Pierce, agent of the Michigan Central R. R. Line of Steamers, there will be an excursion on the steamer *City of Detroit*, Captain William McKay. Invitations have been extended to members of the profession and others to join this excursion accompanied by ladies.

Members joining this excursion will leave the hotel at 1:45 P. M. in carriages, arriving at wharf No. 23 East River street 1:55. The boat leaves at 2 P. M., returning at 5 P. M. On the way out the steamer will sail around the Water Works Crib, and if the weather is favorable an opportunity will be given by those who wish to land and examine the work.

Excursion to Berea and Amherst Stone Quarries. *Charles Paine, manager.*

Those who wish to visit these stone quarries will leave the hotel at 2 P. M., and the Union Depot at 2:15 P. M., thence by way of the C. C. C. & I. Railway; will arrive at Berea at 2:45 P. M., change to open cars and go into the Berea Quarries, under the guidance of Mr. Frank Ford, Chief Engineer, C. C. C. & I. Railway. Returning to Berea Station at 3:45 P. M., take excursion coaches and proceed to Amherst Quarries. Returning by way of L. S. & M. S. R. R., will leave Amherst at 6 P. M., and arrive at the Union Depot at 7 P. M.

By the courtesy of the officers of the C. C. C. & I. and the L. S. & M. S. R. R., a special train will be run for the accommodation of the party.

RECEPTION.

The Union Club of Cleveland, S. L. Mather, President, has tendered a reception to the Society and its invited guests, at the Club House, No. 417 Euclid avenue, about five minutes' walk from the headquarters, Thursday evening, June 19, commencing at 8 o'clock. Those wishing to ride can take the Prospect street cars in front of the hotel direct to the entrance on Euclid avenue.

FRIDAY, JUNE 20.

Charles Latimer, Manager of the Day.

On this day an excursion will be made to the Mahoning Valley coal fields. The party will leave the hotel in carriages at 7:40 A. M., and the Atlantic & Great Western depot at 8 A. M.; arrive at Leavittsburgh at 9:20 A. M.; here a car hoist and transfer may be witnessed. Leave Leavittsburgh at 9:40 A. M.; arrive at Vienna Junction at 10:15 A. M., and arrive at Church Hill coal mines at 10:25 A. M. Here the party will be in charge of Mr. John Tod, President of the Coal Company of Tod, Morris & Co. Leave Church Hill at 11:25 A. M.; arrive at Youngstown at 11:45 A. M.; headquarters at the Tod House. The citizens of Youngstown have provided dinners for the party and carriages for drives to points of interest in Youngstown and vicinity during the afternoon.

During the stay in Youngstown Mr. Robert McCurdy and Mr. Chauncy Andrews will direct the movements of the party. Returning, will leave Youngstown at 4:50 P. M. Arrive at Cleveland at 7:15 P. M.

The excursion train will be under the direction of J. M. Ferris, Superintendent of the M. D. of the A. & G. W. R. R.

BRADFORD OIL DISTRICT.

Members not desiring to go into the Mahoning Valley Coal Fields may take the 7:10 A. M. express on the A. & G. W. R. R., arriving at Bradford at 5:15 P. M. Leaving Bradford at 2:20 P. M. on the next day, can connect with the main line going east at 3 P. M. For the west leave Bradford at 10 A. M. and make close connections, or at 4 P. M. and connect with the main line at 11:39 P. M.

NIAGARA FALLS.

Arrangements have been made, by which eastern members and others wishing to visit the Falls, may leave Cleveland on any of the regular trains, connecting at Buffalo for Niagara Falls.

A large party left Cleveland, as arranged by the above programme, for the Mahoning Valley Coal Fields, where a descent was made into the Great Church Hill Mine. Youngstown was then visited, and industrial works of much engineering interest examined. The Society and its guests were hospitably entertained by a committee of the citizens of Youngstown. A number of the party then visited Niagara Falls.

Another party visited the Oil District at Bradford, Pa., where, under the kind guidance of Mr. Charles Newell, the operations of drilling and tubing oil wells, pumping oil, endeavoring to recover tools lost in the wells, etc., were inspected. The use of natural gas for heating and cooking was also observed.

On Monday morning, June 16th (the day previous to the Convention), a large number of the members of the Society and their guests, *en route* for Cleveland, arrived at Pittsburgh, Pa. Here they were met by the members resident in that city, and first visited the works at Davis Island, where a lock and system of movable dams is in course of construction

Manufacturing Department of the Standard Oil Co., assisted by Mr. W. P. Cowen, Superintendent of the company's works at Cleveland.

Leaving the Standard Oil Co.'s Works at 6:00, will arrive at the Union Passenger Depot at 6:30, and at the hotel at 6:50.

By the courtesy of the officers of the C. & P. and the A. & G. W. R. R.'s, special trains will be run for the accommodation of the excursion party.

The locomotive whistle will be sounded five minutes before leaving each stopping point.

During the stay at the various points the movements of the party will be directed by the Manager of the Day, giving his signal with a policeman's whistle.

By invitation of Miss Sarah E. Fitch, President of the Women's Christian Association, an opportunity will be given the ladies to visit some of the benevolent institutions of the city. Carriages will be in waiting at the hotel at 2:30 P. M.

Session and business meeting at 7:45 P. M.

THURSDAY, JUNE 19.

There will be a social meeting of the Society at 10 A. M., at the City Council Chamber.

Two excursions have been provided for this afternoon.

Excursion on the lake. *John Whitelaw, manager.*

By the courtesy of Captain L. A. Pierce, agent of the Michigan Central R. R. Line of Steamers, there will be an excursion on the steamer *City of Detroit*, Captain William McKay. Invitations have been extended to members of the profession and others to join this excursion accompanied by ladies.

Members joining this excursion will leave the hotel at 1:45 P. M. in carriages, arriving at wharf No. 23 East River street 1:55. The boat leaves at 2 P. M., returning at 5 P. M. On the way out the steamer will sail around the Water Works Crib, and if the weather is favorable an opportunity will be given by those who wish to land and examine the work.

Excursion to Berea and Amherst Stone Quarries. *Charles Paine, manager.*

Those who wish to visit these stone quarries will leave the hotel at 2 P. M., and the Union Depot at 2:15 P. M., thence by way of the C. C. C. & I. Railway; will arrive at Berea at 2:45 P. M., change to open cars and go into the Berea Quarries, under the guidance of Mr. Frank Ford, Chief Engineer, C. C. C. & I. Railway. Returning to Berea Station at 3:45 P. M., take excursion coaches and proceed to Amherst Quarries. Returning by way of L. S. & M. S. R. R., will leave Amherst at 6 P. M., and arrive at the Union Depot at 7 P. M.

By the courtesy of the officers of the C. C. C. & I. and the L. S. & M. S. R. R., a special train will be run for the accommodation of the party.

RECEPTION.

The Union Club of Cleveland, S. L. Mather, President, has tendered a reception to the Society and its invited guests, at the Club House, No. 417 Euclid avenue, about five minutes' walk from the headquarters, Thursday evening, June 19, commencing at 8 o'clock. Those wishing to ride can take the Prospect street cars in front of the hotel direct to the entrance on Euclid avenue.

FRIDAY, JUNE 20.

Charles Latimer, Manager of the Day.

On this day an excursion will be made to the Mahoning Valley coal fields. The party will leave the hotel in carriages at 7:40 A. M., and the Atlantic & Great Western depot at 8 A. M.; arrive at Leavittsburgh at 9:20 A. M.; here a car hoist and transfer may be witnessed. Leave Leavittsburgh at 9:40 A. M.; arrive at Vienna Junction at 10:15 A. M., and arrive at Church Hill coal mines at 10:25 A. M. Here the party will be in charge of Mr. John Tod, President of the Coal Company of Tod, Morris & Co. Leave Church Hill at 11:25 A. M.; arrive at Youngstown at 11:45 A. M.; headquarters at the Tod House. The citizens of Youngstown have provided dinners for the party and carriages for drives to points of interest in Youngstown and vicinity during the afternoon.

During the stay in Youngstown Mr. Robert McCurdy and Mr. Chauncy Andrews will direct the movements of the party. Returning, will leave Youngstown at 4:50 P. M. Arrive at Cleveland at 7:15 P. M.

The excursion train will be under the direction of J. M. Ferris, Superintendent of the M. D. of the A. & G. W. R. R.

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by the United States Government. The operations in progress and the plans for completion were explained by Lieut. F. A. Mahan, United States Engineers, and James H. Harlow, member of the Society.

The Edgar Thomson Steel Works were also visited, and the details of the works, which were in full progress, were inspected.

The new engines at the pump houses of the City Water Works of Pittsburgh, were also examined.

JULY 2D, 1879.—The Society met at 8 P. M. William E. Worthen in the chair.

Ballots for admission to membership were canvassed, and the following were declared elected as members: James A. Burden, of Troy, N. Y., and William G. M. Thomson, of Welland, Ontario, Canada.

The death, on Sunday, June 8th, 1879, at Cincinnati, of James E. Bell, member of the Society, was announced, and the President was authorized to appoint a committee to prepare a memoir of the deceased.

The Board of Direction reported the designation of William E. Worthen to attend the tests of turbines, in accordance with the resolution of the Society of June 4th, 1879. In case of inability to serve by Mr. Worthen, the designation of Charles E. Emery, as an alternate, was announced.

A Paper by W. Milnor Roberts, on the subject of Brazil, its Railway and Water Communications, was read by the Secretary, and discussed by members present.

JULY 16TH, 1879.—The Society met at 8 P. M. Thomas C. Clarke in the chair.

A Paper by De Volson Wood, subject, "The Flow of Water in Rivers," was read by the Secretary, and discussed by Messrs. Clarke, Cooper, North, J. F. Ward, and Yardley.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Alphabets, Pocket Book, including Church Text, Egyptian, Egyptian Perspective, French, French Antique, French Renaissance, German Text, Italic, Italian Shaded, Italian Hairline, Monograms, Old English, Old Roman, Open Roman, Open Stone, Ornamental Roman, Latin, Rustic, Tuscan, &c. New York. *Spons.* \$0.20.
 Anemometer, On the Determination of the Constants of the Cup Anemometer, by Experiments with a Whirling Machine. From the Philosophical Transactions of the Royal Society. Part 2. 1878. 4to. T. R. Robinson. London. *Trubner.* 5s.

Arches, Voussoir Arches applied to Stone Bridges, Tunnels, Domes and Groined Arches. William Cain, C. E. New York. 16mo. No. 42 Science Series. *Van Nostrand.* \$0.50.
 Architecture, Cottages: How to Arrange and Build them to Ensure Comfort, Economy and Health. With Hints on Fittings and Furniture, by a Sanitary Reformer. Illustrated by Woodcuts and Plates. (Ready to Hand Guides.) Post, 8vo, pp. 200. London. *Bemrose.* 3s. 6d.
 Boiler, The Kitchen Boiler and Water Pipes. A few words on their arrangement and

- management; more especially their treatment during frost, and how to avoid explosions. By H. Grimshaw. New York and London. 8vo. *Spons.* \$0.40.
- Bricklaying, Rudiments of practical ——— (Weales Series.) 3d ed. London. 12mo. *Crosby Lockwood.* 1s. 6d.
- Chromatics, Modern ———, with applications to Art and Industry. Ogden N. Hood, Prof. of Physics, Col. Coll., New York. 12mo. *Appletons.* (Announcement.)
- Cleopatra's Needle—The Obelisk of Alexandria: Its Acquisition and Removal to England described. By Lieut. General Sir J. E. Alexander, Kt. C. B. London. 8vo. *Chatto & Windus.* 2s. 6d.
- Coal, A Rudimentary Treatise on Coal and Coal Mining. W. Warrington Smith. London. 12mo. *Crosby Lockwood.* 4s.
- , Coal Mines Inspection: Its History and Results. R. Nelson Boyd. London. 8vo. *W. H. Allen.* 14s.
- Comstock Lode, Its History. John A. Church, E. M., Prof. of Mining, Ohio State Univ. New York. 4to. *Wiley.* \$6.00.
- Drainage, Hints on House Drainage, for Owners, Occupiers and Builders. Henry Ough. London and New York. 8vo. *Spons.* \$0.20.
- Electric Light, The ——— in its practical application. Paget Higge, A. I. C. E. London and New York. 8vo, illus. *Spons.* \$3.50.
- Engineers—Proceedings of the Association of Municipal and Sanitary Engineers and Surveyors. Vol. V. 1877-8. Ed. by C. Jones. London. 8vo. *Spons.* \$4.25.
- The Executive Departments of the United States at Washington. A comprehensive view of the power, functions and duties of the heads of Departments, bureaus and divisions at Washington, as prescribed by law and regulations; together with a description in detail of the organization of each; also a sketch in detail of the impractical operations in the transactions of public affairs, and of business with the people. By Webster Elmes. Washington. 12mo. *W. H. & O. H. Morrison.* \$4.00.
- Filtration of Potable Water. W. Ripley Nichols. New York. 8vo. *Van Nostrand.* \$1.50.
- Foundations and Foundation Walls, for all classes of Buildings; Pile Driving, Building Stones and Bricks, Pier and Wall Construction, Mortars, Limes, Cements, Concretes, Stuccos, etc. By G. T. Powell. With Treatise by Fred'k Baumann. New York. 8vo, illus. *Bicknell & Comstock.* \$1.50.
- Gas Analysis, The Gas Analyst's Manual. By F. W. Hartley, A. I. C. E. Will contain description of Apparatus, Standard Burners, etc., and instructions for the Testing of the Illuminating Powers, Purity, Specific Gravity, etc., of Coal Gas; together with Tables to facilitate calculations. London. 8vo, illus. *Spons.* \$2.50.
- Gas Measurement, Correct ———. G. Glover. London and New York. 8vo. *Spons.* \$0.40.
- Health, How to get strong and how to stay so. W. Blakie. New York. 16mo. *Harpers.* \$1.
- Heat, An introduction to the study of heat. J. Hamblin Smith. 6th ed., rev. and enl. London. 8vo. *Rivingtons.* 3s.
- , New Determinations of the Mechanical Equivalent of Heat. From the Philosophical Transactions of the Royal Society. Part 2. 1878. James Prescott Joule. London. 4to. *Trubner.* 2s.
- Levelling, Hints on Levelling Operations as Applied to the Reading of Distances by the Law of Perspective, and the Saving thereby of Chainmen in a Level Survey. With Remarks on the other Advantages that can be gained in the Survey by adopting this Principle in the use of any Ordinary Levelling Telescope and Staff. W. H. Wells. London. 8vo. *Spons.* 1s.
- Mechanics. R. Stawell Ball. London. (Science Class Books.) 18mo. *Longmans.* 1s. 6d.
- Metalliferous Minerals, Mines and Mining: A treatise on. D. C. Davies. London. 8vo. *Crosby Lockwood.* (Announcement.)
- Military Law, A treatise on ——— and the jurisdiction, constitution and procedure of military courts with a summary of the rules of evidence as applicable to such courts. Lt. Rollins A. Ives, 5th Art. U. S. A., Prof. of Law, U. S. M. A. New York. 8vo. *Van Nostrand.* \$4.00.
- Ordinance Survey, Report for 1878. Maps. *British Govt. Publication.* 4s. 6d.
- Plasterer's Manual, Cont. Description of all tools and materials used in plastering; the appearance and action of every variety of lime and cement; instructions for making all kinds of mortar; for doing all kinds of plain and ornamental plastering; cistern building; form of contract; Useful tables; recipes, etc. K. Cameron. New York. 16mo, illus. *Bicknell & Comstock.* \$0.75.
- Railway Accidents. Inspector's reports. *British Govt. Pub.* 5s. 9d.
- , Signal Arrangements. *British Govt. Pub.* 8d.
- Railway reports, American ———; collection of all reported decisions relative to railways, Vol. 11, 13, 14, 15, 16 (W. W. Ladd, Jr.). N. Y., *Cockcroft & Co.* 1878-79. Ea. 8° shp., \$6.00.
- Railways, Narrow Gauge. C. E. Spooner. London and New York. 8vo, illus., 2d ed. *Spons.* \$6.
- Record, Annual, of Science and Industry for 1878. Spencer F. Baird. New York. 8vo. *Harpers.* \$2.00.
- Roads. The maintenance of Macadamized roads: construction, materials, wear, spreading, sweeping and scraping, drainage, watering, repairs beyond ordinary maintenance, and Management. Thomas Codrington, M. I. C. E. London and New York. 8vo. *Spons.* \$2.50.
- Science Index, The. A Monthly Guide to the contents of Scientific Periodicals: consisting of a Classified Alphabetical List of the titles and authors (if known) of articles of scientific or technical interest that have appeared in periodicals during the previous month. Each issue will comprise about 60 quarto pages. It will be sold only by subscription, payable in advance. London and New York. *Spons.* Price per annum \$6.
- Scientific papers, Catalogue of ——— 1864-73. Compiled by the Royal Society of London. Vol. 3, royal 8vo. *British Govt. Pub.* 20s.
- Sewer Gases: their nature and origin, and how to protect our dwellings. A. de Yarna, M. D. *Brooklyn Eagle Book Print.* 16mo. \$0.75.
- Smithsonian Institution. Documents relative to its origin and history, ed. by W. J. Rhea. Washington, D. C., Smithsonian Institution.

1879. (Smithsonian miscellaneous collection, 328.) Cloth, 8vo.
 Society of Engineers. Transactions, 1878; ed. by P. F. Nurey. London and New York. 8vo. *Spons.* \$6.00.
 Steam Engine. Corliss Engine and Allied Steam Motors working with and without Automatic Variable Expansion Gear, including the latest, most approved engine designs of all countries, with special reference to the steam engines of the Paris International Exhibition of 1878. For engineers, machinists, steam users, and engineering colleges. Translated from W. H. Uhland's work, by A. Tolhausen, Jr., C. E. In folio and 4to. *Spons.* (Announcement.)
 Steel. A Treatise on Steel: its history, manufacture and uses. By J. S. Jeans, Sec. of the Iron and Steel Institute. In one large volume, 8vo, with numerous plates and woodcuts. *Spons.* (Announcement.)
 Surveying. Practice in Underground Surveying and advocacy of Contoured Mining Plans. W. F. Howard. New York. 8vo, plate. *Spons.* \$0.80.
 Table, Graphical Computing —; Book and chart of tables; book contains directions for use of tables which author asserts will "enable anybody, without calculation and at sight," to multiply or divide any two numbers; to find 2d, 3d, or 5th power or root of any number; to obtain the circumference or area of any circle; to multiply or divide by the sine, cosine, tangent or cotangent of any arc; to reduce feet to metres or metres to feet, etc., etc. Lt. W. H. Bixby, U. S. Engineers. New York. 16mo, chart. *Wiley.* \$0.75.
 Tables. Mathematical Tables for Trigonometrical, Astronomical, and Nautical Calculations; to which is prefixed a Treatise on Logarithms, by Henry Law, C. E., together with a series of Tables for Navigation and Nautical Astronomy, by J. R. Young, formerly Professor of Mathematics in Belfast College. New and Revised Edition. London. *Crosby Lockwood.* 3s. 6d.
 Thames River, Prevention of Floods. Report and evidence. *British Govt. Pub.* 1s. 6d.
 Tramways. Report and Evidence. *British Govt. Pub.* 2s. 1d.
 War. Course of Instruction in elements of Art and Science of War, for use of cadets in U. S. Military Academy. J. B. Wheeler, Prof. Mil. Acad. New York. 8vo, illus. *Van Nostrand.* \$1.75.
 War Department. History of War Department U. S.; with biographical sketches of Secretaries. L. D. Ingersoll. Washington. 8vo. *F. B. Mohun.* \$3.50.
 Water. House Sanitation, Water Supply, and Domestic Filtration. Some Remarks on the Internal Water Supply of Dwellings, and the Best Means to be adopted for the removal of the contaminations which result from its storage in tanks and cisterns. With description of the Self-supplying aerated (oxidising) filter, and sketch of Dwelling. J. B. Denton. London. 8vo. *Spons.* 6d.
 Weight Calculator. Being a series of tables exhibiting at one reference the exact value of any Weight from 1 lb. to 15 tons, at 300 progressive rates, from 1 penny to 168 shillings per cwt., and containing 186,000 direct answers, which, with their combinations consisting of a single addition (mostly to be performed at sight), will afford an aggregate of 10,266,000 answers: the whole being calculated and designed to ensure correctness and promote dispatch. By Henry Harben, accountant, Sheffield, author of "The Discount Guide." Third edition. London. Royal 8vo. *Crosby Lockwood.* (Announcement.)
 Weights and Measures Act, 1878 (41 and 42 Vict., Chap. 49); including a practical summary of the Act, with Notes and Cases, together with the memorandum prefixed to the Act, &c.; also the Bread Act, 1836, so far as it relates to Weights and Measures. Slade Butler. 12mo. London. *Shaw & Sons.* 4s.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From American Chemical Society, P. Cassamajor, Secretary, New York: Journal of the Society, Vol. I, Nos. 3 and 4.
 From American Iron and Steel Association, James M. Swank, Secretary, Philadelphia: Annual Report of the Secretary for 1878. Proceedings of the Convention of Iron and Steel Manufacturers and Iron Ore Producers at Pittsburgh, Tuesday, May 6th, 1879.
 From Administration des Ponts et Chaussées, Paris: Annales, April, 1879.
 From Edward R. Andrews, Boston: Chimney Construction. R. M. Bancroft, London.
 From Argentine Scientific Society, Don Felix Amoretti, Secretary, Buenos Ayres: Annales. May, 1879.
 From O. Chanute, New York: General Specifications for Iron Bridges, N.Y., L. E. & W. R. R. Co. O. Chanute, Chief Engineer. (Copies for distribution.)
 From J. James R. Croes, New York: Report on Additional Water Supply for the City of Newark, N.J. By J. J. R. Croes & Geo. W. Howell. March 6th, 1879.
 From Joseph P. Davis, City Engineer, Boston: Fifteenth Annual Report of the Overseers of the Poor of the City of Boston for 1878-9.
 From J. W. Davis, New York: A new Centre of Gravity Formula of general applicability.
 From Dyckerhoff and Söhne, Berlin: Verhandlungen der General Versammlung des Vereins deutscher Cement-Fabrikanten. Feb. 3d, 4th and 5th, 1879.
 From Engineers' Club of Philadelphia: Proceedings of the Club. Vol. I, No. 3.

From Franklin Institute, Philadelphia: Journal of the Institute. June and July, 1879.

From Gen. George S. Greene, New York: Supplementary Report of the Committee on Water Supply of Brookline, Mass., with letter of Gen. George S. Greene.

From James H. Harlow, Pittsburgh, Pa.: Eight Photographs, showing work on Davis Island Dam, Ohio River, Pittsburgh.

From William Haywood, London, England:

Reports in reference to various Asphalte and Wooden pavements in the City of London for 1873, 1874 and 1877.

Report on the Accidents to Horses on Carriageway pavements. By Wm. Haywood.

Report on Experimental Carriageway Pavements in Moorgate street, London. By Wm. Haywood.

Reports of the Works executed by the Commissioners of Sewers of London, from 1871 to 1877 inclusive.

From J. E. Hilgard, Washington, D.C.: Communication from the Secretary of State in response to a resolution of the House of Representatives, in relation to the Convention for establishing an International Bureau of Weights and Measures.

Reports in reference to the adoption of the Metric System.

From Gen. A. A. Humphreys, Chief of Engineers, U.S.A., Washington, D.C.: Report of the Chief of Engineers, U.S.A., for 1878. (In three parts.)

Report of the results of examination of Caney Fork River, and of Obey's River, Tennessee, and of a survey of the Cumberland River, Kentucky. Capt. W. B. King. (2 copies.)

A Communication from the Commanding General, Department of the Missouri, inclosing a report of Explorations in and about Pagosa Springs, Colorado. Lieut. C. A. H. McCauley. (2 copies.)

Report upon United States Geographical Surveys west of the 100th Meridian. Vol. VI. Botany. Lieut. George M. Wheeler.

A Letter of the Acting Chief of Engineers, in relation to the conditions and estimates for the improvement of the harbor and river of Au Sable, on the western shore of Lake Huron. Gen. H. G. Wright. (2 copies.)

Information in relation to the effect produced by the dike across the East Harbor in et, at Provincetown, Mass., upon the deposit of sand in Cape Cod Harbor, at the mouth of said inlet. Gen. H. G. Wright. (2 copies.)

From Institution of Civil Engineers, James Forrest, Secretary, London: Minutes of Proceedings of the Institute. Volume LVI.

Abstracts and papers in Foreign Transactions and Periodicals.

Technical report of the German Railway Union. Walter R. Browne.

Irrigation in Ceylon. Henry Byrne.

The St. Gothard Tunnel. (Second paper.) Daniel K. Clark.

The construction of Heavy Ordnance. James A. Longridge.

The foundations of the New Capitol at Albany, N. Y. W. J. McAlpine.

Movable Bridges. James Price.

On the mapping of a district with reference to a Central Meridian. F. P. Washington.

From Institution of Mechanical Engineers, Walter R. Browne, Secretary, London:

Proceedings of the Institute, April, 1879.

From John T. Lansing, Albany, N. Y.: Articles of Association of the New York and Honduras Mining Company. The Rosario Mining Company of Honduras, Central America.

From Charles Latimer, Cleveland, O.: Proceedings of the Road Masters meeting of the Atlantic and Great Western Railway held at Meadville, Pa., Nov. 14, 1878.

From New York Meteorological Observatory, Daniel Draper, Central Park, New York:

Abstract of registers New York Meteorological Observatory for January, February, March and April, 1879.

From Minister of Public Works, Versailles, France:

Ports Maritimes de la France, Part III.

From Ernest Pontzen, Paris, France: Memoire sur un Nouveau Bèlier Aspirateur de M. de Caligny pouvant tirer l'eau de toutes les profondeurs. M. O. Chemin. Paris, 1879.

Renseignements économiques sur l'emploi des Locomotives à air comprimé pour la traction des Tramways et des Chemins de fer souterrains.

From New York Produce Exchange, James L. Flint, Secretary, New York:

Annual Report of the New York Produce Exchange for 1878.

From the Publishers, Revue Generale des Chemins de fer, Edgar Monjean, Secretary, Paris, France:

Revue Generale des Chemins de fer, March and April, 1889.

From Society of Engineers, Perry F. Nursey, Secretary, London, England: Transactions of the Society for 1878.

From Stevens Institute of Technology, Hoboken, N. J.:

Annual Announcement of the Institute for 1879. (Several Copies.)

From U. S. Light House Board, Washington, D. C.:

List of Beacons, Buoys, Stakes and other Day Marks in the Eighth Light House District, Corrected to July 1st, 1879. (2 Copies.)

List of Towers, Beacons, Buoys, Stakes and other Day Marks in the Fourth Light House District.

From U. S. Naval Observatory, Washington, D. C.:

A Catalogue of 1,963 Stars reduced to the beginning of the year 1850, together with a Catalogue of 290 Double Stars from observations made at Santiago, Chili, in 1850, '51, '52. B. F. Sands.

Investigation of Corrections to Hansen's Tables of the Moon, with tables for their application. S. Newcomb.

On the Right Ascensions of the Equatorial Fundamental Stars. S. Newcomb.

Report of the Commission on site for Naval Observatory.

Report on the Difference of Longitude between Washington and Ogden, Utah. J. R. Eastman.

Report on the Difference of Longitude between Washington and Detroit, Mich.; Carlin, Nevada, and Austin, Nevada. J. E. Eastman.

Report on the Difference of Longitude between Washington and St. Louis. Wm. Harkness.

Tables of Instrumental Constants and Corrections for the reduction of Transit Observations. J. R. Eastman.

The Uranian and Neptunian Systems investigated with the 26-inch Equatorial. S. Newcomb.

From Robert Van Buren, Brooklyn, N. Y.;

Annual Report of the Board of City Works of Brooklyn for 1878.

From H. D. Whitcomb, Richmond, Va.:

Annual Report of the James River Improve-

ment Commission for year ending January 31, 1870.

From other sources :

A description of the Billerica and Bedford 2-feet gauge Railroad.

The American Catalogue, Vol. 1, Authors and Titles. Part 3, Lenoir. Robbie.

The Library Journal. Vol. IV, No. 6.

New Mode of Making Foundations and Anchoring Piles in unstable bottoms or quicksands. Charles Pontez, Patentee.

Reports of the Departments of the Government of the City of Cleveland for year ending December 31, 1877.

THE NORMAN MEDAL.

The following rules have been adopted by the Board of Direction, with the approval of the donor of the Medal Fund, George H. Norman, Member and Fellow of the Society :

CODE OF RULES

FOR THE

AWARD OF THE NORMAN MEDAL.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon \$1,000.00 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent, or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting in November.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

ANNOUNCEMENTS.

At the Meeting of the Society to be held August 6th, a paper by Max E. Schmidt, member of the Society, will be presented, subject, "The South Pass Jetties, Notes on the construction and durability of the works, with a description of the concrete blocks and other constructions of the last year." This paper will be put in print and will be discussed at the meeting of the Society to be held October 15th, 1879. Advance copies of the paper will be sent to persons who will contribute discussion.

At the meeting of September 3d, a paper by William H. Searles, member of the Society, subject, "The Stability of Stone Structures," will be read and discussed.

At the meeting of September 17th, a paper by James D. Burr, member of the Society, subject, "The Construction of the A. T. and S. F. R. R., over the Haton Mountains," will be read and discussed. At the same meeting a paper by Theodore Cooper, Member of the Society, subject, "The use of Steel for Bridges," will be read and discussed. Ad-

vance copies of these papers will be sent to persons who desire to discuss the subject.

At the meeting of October 1st, the paper No. CLXXX (Transactions May 1879), on the Construction and Maintenance of Roads, by Edward P. North, member of the Society, and the discussions presented on the same at the Convention at Cleveland will be considered and further discussed. Advance copies of these discussions will be furnished to persons desiring to discuss the subject.

Discussion on each of these subjects is especially invited. The Secretary will forward the advance copies to those who inform him of their desire to discuss. The discussions may be presented verbally or sent to the Secretary, who will read them for the authors.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad,

and whereas it is desirable that the relation of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of

Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities, afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.



American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, August, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

AUGUST 6TH, 1879.—The Society met at 8 P. M., William E. Worthen in the chair. Ballots for admission to membership were canvassed, and the following were declared elected: As Members, James H. Cunningham, of Milwaukee, Wisconsin; Frederick H. Lehnartz, of Portland, Oregon; and John M. Titlow, of Philadelphia, Pennsylvania; and as Junior, George B. Cornell, of New York.

The death on July 17th, 1879, at Philadelphia, of Franklin A. Stratton, Member of the Society, was announced, and the President was authorized to appoint a committee to prepare a memoir of the deceased.

The paper by Max E. Schmidt, subject: "The South Pass Jetties," which was presented at the Convention at Cleveland, was read by the Secretary and discussed.

THE NORMAN MEDAL.

The following rules have been adopted by the Board of Direction, with the approval of the donor of the Medal Fund, George H. Norman, Member and Fellow of the Society:

CODE OF RULES

FOR THE

AWARD OF THE NORMAN MEDAL.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided.

The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon \$1,000.00 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent, or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting in November.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

LIST OF TOPICS

ON WHICH ORIGINAL PAPERS ARE INVITED.

The Board of Direction submit the following list of topics, on which original papers, illustrating the experience of the writers, are requested:

1.—Topographical Surveys, and the laying out of Towns and the most economical divisions of property.

- 2.—Instruments and methods of exact measurement for land surveys.
- 3.—Trigonometrical and Astronomical surveys.
- 4.—Systems of roadmaking and maintenance suitable for (a) large towns and heavy traffic; (b) Suburban districts; (c) Rural districts.
- 5.—The sustaining power of different kinds of soils and the conditions which produce failure of foundations by settlement.
- 6.—The weight which can be supported by different classes of masonry.
- 7.—The preservation of masonry structures.
- 8.—The manufacture of cements and methods of testing their strength.
- 9.—The proportions of cementing and inert materials in mortars.
- 10.—The preservation of timber used in construction.
- 11.—The strength, durability and characteristics of various timbers.
- 12.—The manufacture of iron and steel in America. Combinations of materials, methods employed and plant used
- 13.—The properties and laws of cast iron, wrought iron, steel and other metals used in construction.
- 14.—The effect of constant or long continued vibration on metals used in construction.
- 15.—The design, generally, of iron bridges of large span.
- 16.—The construction and operation of drawbridges of large span.
- 17.—Testing machines and experiments on the strength of materials and structures.
- 18.—Appliances and methods of rock boring and blasting.
- 19.—Sub-aqueous tunnels. Their design and construction.
- 20.—The flow of water in channels of various kinds, and the modes of determining the discharge by experiment. Also the discharge over weirs and through orifices.
- 21.—The loss of water in flowing in open channels.
- 22.—The relations of rainfall, character of soil, and flow of streams; effect of wooded and of cleared and cultivated land on the flow of streams.
- 23.—The sources and systems of water supply for towns, including storage of surface water, open wells, tube wells, gathering galleries, and ground water obtained from different geological strata.
- 24.—Systems of water supply suitable for small communities, whether separately or co-operatively.
- 25.—The detection and prevention of waste of water in towns.
- 26.—The design, construction, and cost of operation of pumping engines, and mode of computing duty.
- 27.—The history of the manufacture of cast iron water pipes in America.
- 28.—The strength and dimensions of cast iron pipe and of wrought iron pipe for water supply. Forms of joints for water pipe.
- 29.—Durability and cost of water pipe of cast iron, wrought iron and cement, wood, and other materials.

- 30.—The design and construction of earth embankments and masonry dams for reservoirs.
- 31.—The construction, dimensions, and operation of navigable canals.
- 32.—Methods of overcoming differences of level in canals.
- 33.—The improvement and training of rivers.
- 34.—The construction of harbors of refuge.
- 35.—The construction of wharves, piers and docks.
- 36.—The construction of fire-proof buildings.
- 37.—The warming and ventilation of buildings.
- 38.—House drainage.
- 39.—The sewerage of towns and the disposal of sewage.
- 40.—The form, material and dimensions of sewers.
- 41.—The economical location of railroad lines.
- 42.—The construction and maintenance of the permanent way on railroads.
- 43.—The form, manufacture and life of rails.
- 44.—The form and material of railway wheels.
- 45.—The heating and lighting of railroad cars.
- 46.—The prevention of accidents at railroad crossings and intersections.
- 47.—Rapid transit in large cities.
- 48.—The prevention of noise from heavy railroad trains moving at high speed.
- 49.—Safe substitutes for animal power on surface railways.
- 50.—The relative economy of the several kinds of fuel used in locomotive engines.
- 51.—The operation of freight and passenger traffic on railroads, and the conditions of economy in the same.
- 52.—The arrangement of terminal stations on trunk lines of railroads.
- 53.—The manufacture, distribution, measurement and use of illuminating gas.
- 54.—Electricity as applied to lighting and to motive power.
- 55.—The modern construction of water wheels and engines.
- 56.—The engineering questions involved in the location and management of large Industrial Exhibitions.
- 57.—Manufacture, strength and durability of earthenware pipe.
- 58.—The relations of Engineers to Employers and to contractors.
- 59.—The Status and Compensation of Experts.
- 60.—Engineering and Mechanical Law.

ANNOUNCEMENTS.

At the Meeting of the Society to be held September 3d, a paper by William H. Searles, member of the Society, subject, "The Stability of Stone Structures," will be read and discussed. Advanced copies of this paper will be sent to persons who desire to discuss the subject.

At the meeting of September 17th, a paper by James D. Burr, member of the Society, subject, "The Construction of the A. T. and S. F. R. R., over the Baton Mountains," will be read and discussed. At the same meeting a paper by Theodore Cooper, Member of the Society, subject, "The use of Steel for Bridges," will be read and discussed. Advance copies of these papers will be sent to persons who desire to discuss the subject.

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At the meeting of October 15th, the paper by Max E. Schmidt, subject, "The South Pass Jetties," published in the current number of the Transactions, will be discussed.

Discussion on each of these subjects is especially invited. The Secretary will forward the advance copies to those who inform

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LIST OF MEMBERS.

ADDITIONS.

MEMBER.

Date of Election.

BLAND, JOHN C.	(Elected Junior May 5th, 1875), Office of Supervising Architect, Treasury Department, Washington, D. C. . .	June 4th, 1879.
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JUNIOR.

CORNELL, GEORGE B.	Ass't Engineer East Side Line Met. Elev. R. R., 141 Centre St., New York.	August 6th, 1879.
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CHANGES AND CORRECTIONS.

MEMBERS.

CHITTENDEN, SAMUEL H.. U. S. Ass't Engineer, Olio, St. Clair Co., Alabama.

MARSLAND, EDWARD.....New York Gas Light Co., Cor. Twenty-first St. and
Avenue A, New York.

NICHOLS, O. F.....202 Academy St., Trenton, N. J.

NICOLLS, WILLIAM J.....Supervisor Long Island Railroad, Jamaica, Long Island,
N. Y.

PEARSONS, GALEN W.....Kansas City, Kansas.

JUNIORS.

HAINES, CASPAR W.....Supervisor Sub-Division 1, Pittsburg, Fort Wayne and
Chicago Railroad, Eastern Division, Pittsburg, Pa.

HORTON, SANFORD.....Engineer Department, Atchison, Topeka and Santa Fé
Railroad, Topeka, Kansas.

DECEASED.

STRATTON, FRANKLIN A.. Elected Member May 3d, 1876. Died July 17th, 1879.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, September, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 3D, 1879.—The Society met at 8 P.M. Charles H. Haswell in the chair. Ballots were canvassed, and the following declared elected as Members: Frederick N. Finney of Milwaukee, Wis.; John Thomas Lansing of Albany, N.Y., and Henry G. Prout (elected Associate November 6th, 1872,) of Harrisburg, Pa.

A paper by William H. Searles, subject, "The Stability of Stone Structures," was read by the author. Advance copies of this paper having been issued, discussions were presented through the Secretary from O. Chanute, Theodore Cooper, D. J. Whittemore, F. Collingwood and R. Hering. The subject was also discussed by Charles E. Emery, Charles Macdonald and the author.

SEPTEMBER 17TH, 1879.—The Society met at 8 P.M. Thomas C. Clarke in the chair. The paper by Theodore Cooper on the "Use of Steel for Bridges" was read by the Secretary and discussed by T. C. Clarke, A. P. Boller, C. Macdonald, O. Chanute and D. Torrey. The discussion of the paper by James D. Burr on the "Construction of the Railroad over the Raton Mountains" was postponed till the next meeting.

THE NORMAN MEDAL.

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LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

- Army. Report of the Russian Army and its Campaigns in Turkey in 1877-8. By Lieutenant F. V. Greeue, United States Army. Attaché to the American Legation at St. Petersburg. Accompanied by a military atlas. New York. *Appletons*. (Announcement.)
- Art. The Industrial Arts in Spain. By Juan F. Riano. Illustrated with 50 woodcuts. (South Kensington Museum Art Handbooks.) 12mo. New York. *Scribner & Welford*. \$1.50.
- Bridges. Elementary Theory and Calculation of Iron Bridges and Roofs. By August Ritter, Dr. Phil., Professor at the Polytechnic School at Aix-la-Chapelle. Translated from the German (Third Edition) by H. R. Sankey, Lieut. R. E. *Spons*. London. (Announcement.)
- Cables. Strength of Wrought-Iron and Chain Cables. Government experiments by Commodore Beardslee. Edited by Wm. Kent. 8vo. New York. *Wiley*. (Announcement.)
- Car-builder's Dictionary, by a committee of Master Car-builders' Association. Illustrated. New York. *Railroad Gazette*. \$2.25.
- Chemistry. Laboratory teaching. C. Bloxam. Philadelphia. 12mo ill. *Lindsay & Blakiston*. \$1.75.
- List of new and important books on Chemical Analysis, Assaying, etc. Philadelphia. *Henry Carey Baird & Co*.
- Concrete. A Practical Treatise on Natural and Artificial Concrete: Its Varieties and Constructive Adaptations. By Henry Reid, author of "The Science and Art of the Manufacture of Portland Cement," &c. New ed., 8vo. *Spons*. London. 15s.
- Dictionary of Engineering: Supplement to *Spons*. Edited by Ernest Spon. (To be completed in Three Divisions.) Division I. Containing Abacus—Agricultural Implements—Air Compressors—Animal (harcoal) Machinery—Barn Machinery—Belts and Belting—Blasting—Boilers—Brake—Brick-making Machines—Bridge—Cages—Calculus—Canals—Carpentry—Cast-iron—Cement, Concrete, Limes and Mortar—Chimney Shafts—Coal Mining, &c., &c. 8vo. *Spons*. London. 13s. 6d.
- Electric Transmission of Power: Its Present Position and Advantages. By Paget Higgs, LL.D., Dr. Sc. Crown 8vo. *Spons*. London. 3s.
- Encyclopædia. *Spons' Encyclopædia of the Industrial Arts, Manufactures, and Commercial Products*. Edited by G. G. André, F. G. S. Assoc. Inst. C. E. (To be completed in Five Divisions.) Division I.—Containing Acids—Alcohol—Alkalies—Alloys—Alum—Arsenic—Asphalt—Assaying—Beverages, &c. Super-royal 8vo. *Spons*. London. 13s. 6d.
- Engineers' Manual. A Manual for Railroad Engineers and Engineering Students. Containing the Rules and Tables needed for the Location, Construction, and Equipment of Railroads, as built in the United States. By George L. Vose. With 165 woodcuts and 31 large Plates. A new revised edition. Boston. *Lee & Shepard*. \$12.50.
- Expert Testimony: Its use and abuse. S. Snowden Bell. Philadelphia, 8vo. *Rees, Welsh & Co*. \$1.00.
- Graphics for Engineers. Part III. Arches in Wood, Iron and Stone. Prof. Greene. 8vo. New York. *Wiley*. (Announcement.)
- Locomotive Engineer, Fireman and Engine Boy; comprising an Historical Notice of the Pioneer Locomotive Engines and their inventors, with a Project for the Establishment of Certificates of Qualification in the Running Service of Railways. Michael Reynolds. Cr. 8vo. *Crosby Lockwood*. 4s. 6d.
- Mechanics. C. Tomlinson (Weales' Series). New ed., 12mo. London. *Crosby Lockwood*. 1s. 6d.
- Meteorology. The Nottingham — for the past 12 years, 1867 to 1878 inclusive. From Diurnal Observations by M. Ogle Tarbotton; to which are added Rainfall Tables from several localities on the Trent Watershed. Roy. 8vo. *Spons*. London. 1s. 6d.
- Military Prize Essay, 1879. Clayton (Captain Emilius). Field Intrenching; its Application on the Battlefield and its Bearing on Tactics. With Plates. 8vo. London. *W. Mitchell*. 2s. 6d.
- Mining, Mining Machinery and Coal. List of Books upon these subjects, *Henry Carey Baird & Co*. Philadelphia.
- Parks and Gardens of Paris. W. Robinson, F.L.S. With numerous Illustrations. 8vo. *Macmillan*. London (cheaper issue). 18s.
- Railroad Accidents; Notes upon—. Charles Francis Adams, Jr. 12mo. New York. *Putnams*. \$1.25.
- Rainfall—British, 1878. On the Distribution of Rain over the British Isles during the year 1878, as observed at about 2,000 Stations in Great Britain and Ireland. G. J. Symons. 8vo. London. *Stanford*. 5s.

- Railway System**—The Index to our Railway System and our Leading Lines: A Comprehensive Analysis of Railway Property, 1878-79. No. 2. Wm. Fleming. London. 8vo. *McCordqudale*, 2s. 6d.
- Sanitary Engineering**. Report of the Proceeding of the District Meeting of Municipal and Sanitary Engineers and Surveyors held at the Town Hall, Wrexham, June 21st, 1879; Discussion on Shone's Patent Pneumatic Sewerage System. 4to. Discussion, *fcap. Brayley and Bradley* (Wrexham). *Spons.* London. 1s.
- Science, Half-hour Recreations in Popular**—Second Series, uniform with the First Series, containing: Transmission of Sound by the Atmosphere, by John Tyndall; Gigantic Cuttle-Fish, by Saville Kent; The Glacial Epoch of our Globe, by Alexander Braun; The Sun and the Earth, by Prof. Balfour Stewart; The Ice Age in Britain, by Prof. Geikie; Plant Life in the Sea, by L. Kny; The Telephone and the Phonograph, by Prof. F. G. Garbit; The Use and Abuse of Food, Ozone, Dew; The Levelling Power of Rain, by Richard A. Proctor; The Succession of Life on the Earth, by Prof. W. C. Williamson; What the Earth is Composed of, by Prof. Roscoe; Notes on Tree Growth, by Prof. Asa Gray; Science and War, by H. Baden Pritchard; Existence of Glacial Action upon the Summit of Mt. Washington, N. H., by Prof. C. H. Hitchcock. One vol., large 12mo. Boston. *Estes & Lauriat*. \$2.50.
- Sewerage**. Discussions on Isaac Stone's Pneumatic Sewerage System, by Engineers, Surveyors and Medical Doctors, convened under the Auspices of the "Sanitary Register," held in the Town Hall, Wrexham, July 19, 1879, under the Presidency of Fr. Lory Marsh. Roy. 8vo "Guardian" Office (Wrexham). *Spons.* London. 6d.
- Sewers and drains of populous districts**, by Col. J. W. Adams. New York. *Van Nostrand*. (Announcement.)
- Thames Traffic**. Report, evidence, maps. *British Govt. Publication*. London. 8s.
- Thermodynamics**. Prof. Henry T. Eddy. 18mo. (No. 45. Science Series). *Van Nostrand*. New York. \$0.50.
- Tunneling**—Practical Tunneling, explaining in detail the setting out works, shaft sinking, heading driving, ranging lines, leveling under ground, sub-excavating, timbering, construction of brickwork of tunnels, with labor required for and cost of various portions of the work. By Frederick Walter Simms, C.E. 3d ed., rev. and extended with chapters illustrating the recent practice at St. Gothard, Mt. Cenis and other modern works. By D. Kinnear Clark, C.E. 8vo, illus. *Van Nostrand*. New York. \$7.50.
- Water**—Analysis of Water. J. A. Wanklyn and E. T. Chapman. 5th ed., cr. 8vo. London. *Trubner*. 5s.
- Address upon Water Economy, delivered at the Anniversary Meeting of the Sanitary Institute, July 10th, 1879. His Grace the Duke of Northumberland in the chair. G. Symons. Cr. 8vo, pp. 23. *Stanford*. London. 1s.
- Power of Water. J. Glynn. New ed., 12mo. (Weales' series.) *Crosby Lockwood*. London. 2s.
- National Water Supply, Sewage and Health. Annual Conference, Society of Arts, Adelphi, held Thursday and Friday, the 15th and 16th May, 1879. Imp. 8vo. *Bell and Sons*. London. 1s. 6d.; 2s.
- Wave and Vortex Motion**. Thomas Craig. 18mo. (No. 43. Science Series). *Van Nostrand*. New York. \$0.50.
- Weights**: Tabulated Weights, of Angle, Tee, Bulb, Round, Square and Flat Iron and Steel, and other Information for the use of Naval Architects and Shipowners. By Chas. H. Jordan, Mem. Inst. N.A., Surveyor to the Underwriters' Registry for Iron Vessels. Third Edition, rev. and enl., royal 32mo, cloth. *Spons.* London. 2s. 6d.
- Wood Engraving**—Practical Hints. For the instruction of reviewers and the public. W. J. Linton. 4to. *Lee & Shepard*. Boston. \$0.50.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From Administration des Ponts et Chaussées, Paris:
Annales. May, June and July, 1879.
 List of Members Ponts et Chaussées.
- From American Academy of Arts and Sciences, Boston:
Proceedings from May 1878 to May 1879.
- From American Chemical Society, P. Cassinajor, Secretary, New York:
Proceedings of the Society. Vol. 1, Nos. 4 and 6.
- From American Institute of Mining Engineers, Prof. Thomas M. Drown, Secretary, Easton, Pa.:
 The Toxic Gas Producer. A. L. Holley.
 On some curious phenomena in making a Test of Bessemer Steel. Wm. Kent.
- Accidents in the Comstock Mines and their relation to deep mining. John A. Church.
 On the use of determining Slag densities in Smelting. Thomas Macfarlane.
 The Antimony deposits of Arkansas. Charles E. Wait.
 Discussion of Charles B. Dudley's paper on Steel Rails, read at the Lake George Meeting, October, 1877. By R. W. Hunt, W. R. Jones, T. Egleston, A. L. Holley, W. Metcalf, Wm. Kent, D. Torrey, H. M. Howe, C. E. Stafford, R. W. Raymond, W. E. C. Coxe, A. S. McCreath and Wm. P. Shinn.
 Note on the Wear of Iron Rails. W. E. C. Coxe.
 On an apparatus for Testing the resistance of metals to repeated shocks. Wm. Kent.
 Pittsburgh—Its resources and surroundings. Wm. P. Shinn.

Proceedings of the Pittsburgh Meeting, May 13, 1879.

Regenerative Stoves, a sketch of their history and notes on their use. John M. Hartman. Sketches of the New Mining District at Sullivan, Maine. C. W. Kempton.

The working of the three Hearths at the Cedar Point Furnace, Port Henry, N. Y. T. F. Witherbee.

From George D. Ansley, City Surveyor, Montreal:

Our Health and our Diseases; condition of Montreal in a Sanitary point of view. F. P. Mackelan, Montreal.

From Argentine Scientific Society, Don Felix Amoretti, Secretary, Buenos Ayres:

Annales, June and July, 1879.

From Board of Water Commissioners, Toronto, Canada:

Annual Reports of the Board for 1875, 1876, 1877 and 1878.

From Boston Public Library, Boston: Twenty-seventh Annual Report of Boston Public Library.

From Hon. Allan Campbell, New York: Report of the Department of Public Works, quarter ending March 31, 1879.

From E. S. Chesbrough, Chicago:

Third Annual Report Department of Public Works of Chicago.

From Civil Engineers' Club of the Northwest. L. P. Morehouse, Secretary, Chicago:

Proceedings of the Club.

Metric System.

Memorial of William H. Clarke.

Superstructure of the Glasgow Bridge.

Proposed Constitution and By-Laws by Committee on Reorganization.

From Prof. John Collet, Indianapolis, Ind.:

Eighth, Ninth and Tenth Annual Report of the Geological Survey of Indiana, made during the years 1876-77-78. E. T. Cox, Indianapolis, 1879.

From Joseph P. Davis, City Engineer, Boston:

Third Annual Report of the Boston Water Works.

From Maj. George W. Dresser, Secretary of Society of Gas Lighting, New York:

Transactions of the Society for 1877.

From Essayons Club, Corps of Engineers, U. S. A. W. M. Black, Secretary, Willets Point, N. Y.:

Papers read before the Club during the winter 1878-79, as follows: XLV, Useful Tables for finding Specific Gravity. Lieut.-Col. Heger. XLVI—Notes on the use of Logarithms. H. S. Palfrey. XLVII—Testing of medium and high tension fuses. Gen. Abbot.

From Deamond Fitzgerald, Brookline, Mass.:

Third Annual Report of the Boston Water Works.

From Charles E. Fowler, City Surveyor, Hartford, Conn.:

Annual Reports of the Street Department of the City of New Haven, for 1876, 1877, and 1878.

From the Imperial College of Engineering, Henry Dyer, Principal, Tokio, Japan:

Reports of the Principal and Professors from 1873 to 1877.

From the Imperial and Royal Legation of Austria:

Beiträge zur Beleuchtung der allgemeiner Verhältnisse der Oesterreichischen Eisenbahnen.

From the Imperial Technic Society, Prof. Paul Panayeff, Director, Moscow, Russia:

Notes of the Society. Part 6 (Russian).

From the Institution of Civil Engineers, James Forrest, Secretary, London:

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Street Carriageway Pavements. George F. Deacon.

Wood as a Paving Material under Heavy Traffic. Osbert H. Howarth.

Discussion on the two foregoing subjects. Experiments on the Filtration of Water. George Higgins.

From the Iron and Steel Institute, J. S. Jeans, Secretary, London:

Journal of the Institute, No. 1. 1879.

From Henry F. Kane, C. E., New York:

Address to the Members of the New York Exchange, by Henry F. Kane, On the Practicability of permanently maintaining several feet increased depth over the Sandy Hook Bar, and otherwise improving the Channel,

From Charles Latimer, Cleveland, O.:

The French Metric System, or the Battle of the Standards. (Several copies.)

From Hon. R. C. McCormick, Washington, D. C.:

Our Success at Paris in 1878. R. C. McCormick. New York, 1879.

From W. H. McFadden, Philadelphia:

Annual Report of the Chief Engineer of the Water Department of the City of Philadelphia for 1878.

From Midland Institute of Mining, Civil and Mechanical Engineers,

Joseph Mitchell, Secretary, Barnsley, England:

- Railway System**—The Index to our Railway System and our Leading Lines: A Comprehensive Analysis of Railway Property, 1878-79. No. 3. Wm. Fleming. London. 8vo. *McCorquodale*. 2s. 6d.
- Sanitary Engineering**. Report of the Proceeding of the District Meeting of Municipal and Sanitary Engineers and Surveyors held at the Town Hall, Wrexham, June 21st, 1879; Discussion on Shone's Patent Pneumatic Sewerage System. 4to. Discussion, fcap. *Brayley and Bradley* (Wrexham). *Spons*. London. 1s.
- Science, Half-hour Recreations in Popular**—Second Series, uniform with the First Series, containing: Transmission of Sound by the Atmosphere, by John Tyndall; Gigantic Cuttle-Fish, by Saville Kent; The Glacial Epoch of our Globe, by Alexander Braun; The Sun and the Earth, by Prof. Balfour Stewart; The Ice Age in Britain, by Prof. Geikie; Plant Life in the Sea, by L. Kny; The Telephone and the Phonograph, by Prof. F. G. Garbit; The Use and Abuse of Food, Ozone, Dew; The Levelling Power of Rain, by Richard A. Proctor; The Succession of Life on the Earth, by Prof. W. C. Williamson; What the Earth is Composed of, by Prof. Roscoe; Notes on Tree Growth, by Prof. Asa Gray; Science and War, by H. Baden Pritchard; Existence of Glacial Action upon the Summit of Mt. Washington, N. H., by Prof. C. H. Hitchcock. One vol., large 12mo. Boston. *Estes & Lauriat*. \$2.50.
- Sewerage**. Discussions on Isaac Stone's Pneumatic Sewerage System, by Engineers, Surveyors and Medical Doctors, convened under the Auspices of the "Sanitary Register," held in the Town Hall, Wrexham, July 19, 1879, under the Presidency of Dr. Lory Marsh. Roy. 8vo. "*Guardian*" Office (Wrexham). *Spons*. London. 6d.
- Sewers and drains of populous districts**, by Col. J. W. Adams. New York. *Van Nostrand*. (Announcement.)
- Thames Traffic**. Report, evidence, maps. *British Govt. Publication*. London. 8s.
- Thermodynamics**. Prof. Henry T. Eddy. 18mo. (No. 45. Science Series). *Van Nostrand*. New York. \$0.50.
- Tunnelling**—Practical Tunnelling, explaining in detail the setting out works, shaft sinking, heading driving, ranging lines, leveling under ground, sub-excavating, timbering, construction of brickwork of tunnels, with labor required for and cost of various portions of the work. By Frederick Walter Simms, C. E. 3d ed., rev. and extended with chapters illustrating the recent practice at St. Gothard, Mt. Cenis and other modern works. By D. Kinnear Clark, C. E. 8vo, illus. *Van Nostrand*. New York. \$7.50.
- Water—Analysis of Water**. J. A. Wanklyn and E. T. Chapman. 5th ed., cr. 8vo. London. *Trubner*. 5s.
- Address upon Water Economy, delivered at the Anniversary Meeting of the Sanitary Institute, July 10th, 1879, His Grace the Duke of Northumberland in the chair. G. Symons. Cr. 8vo, pp. 23. *Stanford*. London. 1s.
- Power of Water. J. Glynn. New ed., 12mo. (Weales' series.) *Crosby Lockwood*. London. 2s.
- National Water Supply, Sewage and Health. Annual Conference, Society of Arts, Adelphi, held Thursday and Friday, the 15th and 16th May, 1879. Imp. 8vo. *Bell and Sons*. London. 1s. 6d.; 2s.
- Wave and Vortex Motion**. Thomas Craig. 18mo. (No. 43. Science Series). *Van Nostrand*. New York. \$0.50.
- Weights**; Tabulated Weights, of Angle, Tee, Bulb, Round, Square and Flat Iron and Steel, and other Information for the use of Naval Architects and Shipowners. By Chas. H. Jordan, Mem. Inst. N.A., Surveyor to the Underwriters' Registry for Iron Vessels. Third Edition, rev. and enl., royal 32mo, cloth. *Spons*. London. 2s. 6d.
- Wood Engraving**—Practical Hints. For the instruction of reviewers and the public. W. J. Linton. 4to. *Lee & Shepard*. Boston. \$0.50.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From Administration des Ponts et Chaussées, Paris:
Annales, May, June and July, 1879.
List of Members Ponts et Chaussées.
- From American Academy of Arts and Sciences, Boston:
Proceedings from May 1878 to May 1879.
- From American Chemical Society, P. Cassanajor, Secretary, New York:
Proceedings of the Society. Vol. 1. Nos. 4 and 6.
- From American Institute of Mining Engineers, Prof. Thomas M. Drown, Secretary, Easton, Pa.:
The Tescic Gas Producer. A. L. Holley.
On some curious phenomena in making a Test of Bessemer Steel. Wm. Kent.
- Accidents in the Comstock Mines and their relation to deep mining**. John A. Church.
On the use of determining Slag densities in Smelting. Thomas Macfarlane.
The Antimony deposits of Arkansas. Charles E. Wait.
- Discussion of Charles B. Dudley's paper on Steel Rails, read at the Lake George Meeting, October, 1877**. By R. W. Hunt, W. R. Jones, T. Egleston, A. L. Holley, W. Metcalf, Wm. Kent, D. Torrey, H. M. Howe, C. E. Stafford, R. W. Raymond, W. E. C. Coxe. A. S. McCreath and Wm. P. Shinn.
Note on the Wear of Iron Rails. W. E. C. Coxe.
On an apparatus for Testing the resistance of metals to repeated shocks. Wm. Kent.
Pittsburgh—Its resources and surroundings. Wm. P. Shinn.

Proceedings of the Pittsburgh Meeting, May 13, 1879.

Regenerative Stoves, a sketch of their history and notes on their use. John M. Hartman. Sketches of the New Mining District at Sullivan, Maine. O. W. Kempton.

The working of the three Hearths at the Cedar Point Furnace, Port Henry, N. Y. T. F. Witherbee.

From George D. Analey, City Surveyor, Montreal:

Our Health and our Diseases; condition of Montreal in a Sanitary point of view. F. P. Mackelan, Montreal.

From Argentine Scientific Society, Don Felix Amoretti, Secretary, Buenos Ayres:

Annales, June and July, 1879.

From Board of Water Commissioners, Toronto, Canada:

Annual Reports of the Board for 1875, 1876, 1877 and 1878.

From Boston Public Library, Boston: Twen'y-seventh Annual Report of Boston Public Library.

From Hon. Allan Campbell, New York: Report of the Department of Public Works, quarter ending March 31, 1879.

From E. S. Chesbrough, Chicago: Third Annual Report Department of Public Works of Chicago.

From Civil Engineers' Club of the Northwest. L. P. Morehouse, Secretary, Chicago: Proceedings of the Club. Metric System.

Memorial of William H. Clarke. Superstructure of the Glasgow Bridge. Proposed Constitution and By-Laws by Committee on Reorganization.

From Prof. John Collet, Indianapolis, Ind.:

Eighth, Ninth and Tenth Annual Report of the Geological Survey of Indiana, made during the years 1876-77-78. E. T. Cox, Indianapolis, 1879.

From Joseph P. Davis, City Engineer, Boston:

Third Annual Report of the Boston Water Works.

From Maj. George W. Dresser, Secretary of Society of Gas Lighting, New York:

Transactions of the Society for 1877.

From Essayons Cub, Corps of Engineers. U. S. A. W. M. Black, Secretary. Willetts Point, N. Y.:

Papers read before the Club during the winter 1878-79, as follows: XLV. Useful Tables for finding Specific Gravity. Lieut.-Col. Heger. XLVI.—Notes on the use of Logarithms. H. S. Palfrey. XLVII.—Testing of medium and high tension fuses. Gen. Abbot.

From Deamond Fitzgerald, Brookline, Mass.:

Third Annual Report of the Boston Water Works.

From Charles E. Fowler, City Surveyor, Hartford, Conn.:

Annual Reports of the Street Department of the City of New Haven, for 1876, 1877, and 1878

From the Imperial College of Engineering, Henry Dyer, Principal, Tokio, Japan:

Reports of the Principal and Professors from 1873 to 1877.

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From W. H. McFadden, Philadelphia:

Annual Report of the Chief Engineer of the Water Department of the City of Philadelphia for 1878.

From Midland Institute of Mining, Civil and Mechanical Engineers. Joseph Mitchell, Secretary, Barnsley, England:

Transactions. November, 1878. February, March, May and July, 1879. Vol. VI, Part XLVI.

From New York Meteorological Observatory, Daniel Draper, Director, New York:
Abstracts of Registers from Self-Recording Instruments. June and July, 1879.

From North of England Institute Mining and Mechanical Engineers, Theo. Wood Bunning, Secretary, Newcastle-on-Tyne, England:
Transactions. April, May and June, 1879.

From the Publishers *Revue Générale des Chemins de fer*, Edgar Monjean, Secretary. Paris:
Revue Générale des Chemins de fer. May and June, 1879.

From Philadelphia and Reading Coal and Iron Co. Philadelphia:
Diagram and Tables showing the Annual Production of Anthracite Coal in Pennsylvania since 1820, and the amount produced from each region.

From Royal United Service Institution, Capt. B. Burgess, Secretary, London:
Appendix to Vol. XXII of the Journal of the Institution.
Vol. XXIII, Journal of the Institution, No. C. Extra number.

From Société des Ingénieurs Civils, M. Mallet, Secretary, Paris:
Mémoires de la Société. November and December, 1878. January, February, March and April, 1879.

From R. H. Thurston, Hoboken, N. J.:
Friction and Lubrication. Prof. R. H. Thurston. New York, 1879.
Mechanical and Physical Properties of the Copper-Tin Alloys. Prof. R. H. Thurston. Washington, 1879.

From United States Light House Board, Washington, D. C.:
List of Beacons, Buoys, Monuments and other Day Marks in the First Light House District, corrected to July 1, 1879.

From Jerome B. Ward, Newark, N. J.:
Report on Additional Water Supply for the City of Newark, N. J. By J. James R. Croes and George W. Howell. March 6th, 1879. (Several copies.)

From Hon. A. A. Wagstaff, New York:
Annual Report of the Superintendent of Public Works, State of New York, for 1878. B. S. W. Clark.

Annual Financial Report of the Auditor of the Canal Department of the State of New York for 1878. G. W. Schuyler.

Second Annual Report of the Superintendent of State Prisons of the State of New York. Louis D. Pillsbury.

Report of the Board of Commissioners of Pilots, December 31st, 1878.

Communication from the Superintendent of State Prisons relative to the Contract System in the State Prisons. L. D. Pillsbury.

Communication from the Acting Chief of Engineers, U. S. A., relative to the Pier and Bulkhead Lines of New York Harbor. Gen. H. G. Wright.

A Proposed New City Park for the extreme Eastern portion of New York. Wm. J. Fryer, Jr.

The Necessity to Commerce of Cheap Water Communication between the West and East. An Address to the Farmers of Ohio, Indiana and Illinois.

From Gen. H. G. Wright, Chief of Engineers, U. S. A. Washington, D. C.:
Reports upon the Specimens obtained from Borings made in 1874 between the Mississippi River and Lake Borgne, at the site proposed for an outlet for flood water. Prof. Eugene W. Hilgard and Dr. F. V. Hopkins.

On the Use of the Barometer on Surveys and Reconnaissances. Lieut. Col. R. S. Williamson.

Eleventh Report upon the Improvement of the South Pass of the Mississippi River. Capt. M. R. Brown. (Copies for distribution.)

From A. F. Wrotnowski, New Orleans:
Topographical and Drainage Map of New Orleans and Surroundings.

ANNOUNCEMENTS.

At the meeting of the Society of October 1st, the paper by James D. Burr, member of the Society, subject, "The Construction of the Railroad over the Raton Mountains," will be read and discussed.

At the meeting of October 1st, the paper No. CLXXX (Transactions May 1879), on the Construction and Maintenance of Roads, by Edward P. North, member of the Society, and the discussions presented on the same at the Convention at Cleveland will also be considered and further discussed. Advance copies of these discussions will be furnished to persons desiring to discuss the subject.

At the meeting of October 15th, the paper by Max E. Schmidt, subject, "The South Pass Jetties," published in the current number of the Transactions, will be discussed.

Discussion on each of these subjects is especially invited. The Secretary will forward the advance copies to those who inform him of their desire to discuss. The discussions may be presented verbally or sent to the Secretary, who will read them for the authors.

The Twenty-seventh annual meeting of the Society will be held at its rooms in New York, on November 5th, 1879, at 10 A.M.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation

of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of

Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities, afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

CUNNINGHAM, JAMES H.	Engineer and Proprietor, Milwaukee Bridge and Iron Works, Milwaukee, Wis.....	August 6, 1879.
FINNEY, FREDERICK N.	General Manager, Wisconsin Central Railroad, Milwaukee, Wis	Sept. 3, "
PROUT, HENRY G.	(Elected Associate, Nov. 6, 1872), 12 Barclay street, New York.....	" "
TITLOW, JOHN M.	Ass't Engineer, Department of Surveys, E. Entrance, City Hall, Philadelphia, Pa.....	August 6, "

CHANGES AND CORRECTIONS.

MEMBERS.

ALLEN, C. FRANK	Engineers' office, New Mexico & Southern Pacific Rail- road, Las Vegas, New Mexico.
MORSS, FOSTER	Engineer Shenandoah Valley Railroad, Berryville, Va.
WHITNEY, JOSEPH	Cambridgeport, Mass.

JUNIOR.

LUCAS, D. JONES	Box 405, Lewiston, Maine.
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RESIGNATION.

STEELE, J. DUTTONSeptember 5th, 1879.

DEATH.

COLBURN, WARREN.....Elected Member, March 18th, 1868. Died September 16th, 1879.



American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, October, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

OCTOBER 1st, 1879.—The Society met at 8 P. M., William H. Paine in the chair. Ballots were canvassed, and Thomas M. Cleeman, of Philadelphia, Pa., and Irvin John, of New York, were declared elected members. The vote was canvassed on resolutions submitted to letter ballot, with the following result :

On the resolution :

Resolved, That a standing committee of seven, representing different sections of the country, be appointed from the American Society of Civil Engineers, who shall examine into the entire subject of the preservation of timber, and report to the Society from time to time, and who shall collect such samples and data as they may be able, to aid in determining the relative values of the different woods, both preserved and unpreserved, in ordinary use in various parts of the country.

There were 149 yeas and 7 noes.

This resolution was thereupon declared adopted.

On the resolution :

Resolved, That a committee of seven members of the Society be appointed by the Board of Direction to devise and report a uniform system for tests of cement.

There were 147 yeas and 9 noes.

This resolution was thereupon declared adopted.

The death, on September 16th, 1879, of Warren Colburn, member of the Society, was announced, and the Chairman was authorized to appoint a committee to prepare a memoir of the deceased.

CHANGES AND CORRECTIONS.

MEMBERS.

- CHITTENDEN, SAMUEL H.. U. S. Ass't Engineer, Olio, St. Clair Co., Alabama.
- MARSLAND, EDWARD.....New York Gas Light Co., Cor. Twenty-first St. and Avenue A, New York.
- NICHOLS, O. F.....202 Academy St., Trenton, N. J.
- NICOLLS, WILLIAM J.....Supervisor Long Island Railroad, Jamaica, Long Island, N. Y.
- PEARSONS, GALEN W.....Kansas City, Kansas.

JUNIORS.

- HAINES, CASPAR W.....Supervisor Sub-Division 1, Pittsburg, Fort Wayne and Chicago Railroad, Eastern Division, Pittsburg, Pa.
- HORTON, SANFORD.....Engineer Department, Atchison, Topeka and Santa Fé Railroad, Topeka, Kansas.

DECEASED.

- STRATTON, FRANKLIN A.. Elected Member May 3d, 1876. Died July 17th, 1879.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, September, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 3D, 1879.—The Society met at 8 P.M. Charles H. Haswell in the chair. Ballots were canvassed, and the following declared elected as Members: Frederick N. Finney of Milwaukee, Wis.; John Thomas Lansing of Albany, N.Y., and Henry G. Prout (elected Associate November 6th, 1872,) of Harrisburg, Pa.

A paper by William H. Searles, subject, "The Stability of Stone Structures," was read by the author. Advance copies of this paper having been issued, discussions were presented through the Secretary from O. Chanute, Theodore Cooper, D. J. Whittemore, F. Collingwood and R. Hering. The subject was also discussed by Charles E. Emery, Charles Macdonald and the author.

SEPTEMBER 17TH, 1879.—The Society met at 8 P.M. Thomas C. Clarke in the chair. The paper by Theodore Cooper on the "Use of Steel for Bridges" was read by the Secretary and discussed by T. C. Clarke, A. P. Boller, C. Macdonald, O. Chanute and D. Torrey. The discussion of the paper by James D. Burr on the "Construction of the Railroad over the Raton Mountains" was postponed till the next meeting.

THE NORMAN MEDAL.

The following rules have been adopted by the Board of Direction, with the approval of the donor of the Medal Fund, George H. Norman, Member and Fellow of the Society:

CODE OF RULES

FOR THE

AWARD OF THE NORMAN MEDAL.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon \$1,000.00 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent, or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting in November.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

- Army. Report of the Russian Army and its Campaigns in Turkey in 1877-8. By Lieutenant F. V. Greene, United States Army. Attaché to the American Legation at St. Petersburg. Accompanied by a military atlas. New York. *Appletons*. (Announcement.)
- Art. The Industrial Arts in Spain. By Juan F. Riano. Illustrated with 50 woodcuts. (South Kensington Museum Art Handbooks.) 12mo. New York. *Scribner & Welford*. \$1.50.
- Bridges. Elementary Theory and Calculation of Iron Bridges and Roofs. By August Ritter, Dr. Phil. Professor at the Polytechnic School at Aix-la-Chapelle. Translated from the German (Third Edition) by H. R. Sankey, Lieut. R. E. *Spons*. London. (Announcement.)
- Cables. Strength of Wrought-Iron and Chain Cables. Government experiments by Commodore Beardslee. Edited by Wm. Kent. 8vo. New York. *Wiley*. (Announcement.)
- Car-builder's Dictionary. by a committee of Master Car-builders' Association. Illustrated. New York. *Railroad Gazette*. \$2.25.
- Chemistry. Laboratory teaching. C. Bloxam. Philadelphia. 12mo ill. *Lindsay & Blakiston*. \$1.75.
- List of new and important books on Chemical Analysis, Assaying, etc. Philadelphia, *Henry Carey Baird & Co.*
- Concrete. A Practical Treatise on Natural and Artificial Concrete: Its Varieties and Constructive Adaptations. By Henry Reid, author of "The Science and Art of the Manufacture of Portland Cement," &c. New ed., 8vo. *Spons*. London. 15s.
- Dictionary of Engineering: Supplement to *Spons*. Edited by Ernest Spon. (To be completed in Three Divisions.) Division I. Containing Abacus—Agricultural Implements—Air Compressors—Animal (harcoal) Machinery—Barn Machinery—Belts and Belting—Blasting—Boilers—Brake—Brick-making Machines—Bridge—Cages—Calculus—Canals—Carpentry—Cast-iron—Cement, Concrete, Limes and Mortar—Chimney Shafts—Coal Mining, &c., &c. 8vo. *Spons*. London. 13s. 6d.
- Electric Transmission of Power: Its Present Position and Advantages. By Paget Higgs, LL.D., Dr. Sc. Crown 8vo. *Spons*. London. 3s.
- Encyclopædia. *Spons'* Encyclopædia of the Industrial Arts, Manufactures, and Commercial Products. Edited by G. G. André, F. G. S. Assoc. Inst. C. E. (To be completed in Five Divisions.) Division I.—Containing Acids—Alcohol—Alkalis—Alloys—Alum—Arsenic—Asphalt—Assaying—Beverages, &c. Super-royal 8vo. *Spons*. London. 13s. 6d.
- Engineers' Manual. A Manual for Railroad Engineers and Engineering Students. Containing the Rules and Tables needed for the Location, Construction, and Equipment of Railroads, as built in the United States. By George L. Vose. With 165 woodcuts and 31 large Plates. A new revised edition. Boston. *Lee & Shepard*. \$12.50.
- Expert Testimony: Its use and abuse. S. Snowden Bell. Philadelphia, 8vo. *Rees, Welsh & Co.* \$1.00.
- Graphics for Engineers. Part III. Arches in Wood, Iron and Stone. Prof. Greene. 8vo. New York. *Wiley*. (Announcement.)
- Locomotive Engineer, Fireman and Engine Boy; comprising an Historical Notice of the Pioneer Locomotive Engines and their inventors, with a Project for the Establishment of Certificates of Qualification in the Running Service of Railways. Michael Reynolds. Cr. 8vo. *Crosby Lockwood*. 4s. 6d.
- Mechanics. C. Tomlinson (Weales' Series). New ed., 12mo. London. *Crosby Lockwood*. 1s. 6d.
- Meteorology. The Nottingham — for the past 12 years, 1867 to 1878 inclusive. From Diurnal Observations by M. Ogilvie Tarbotton; to which are added Rainfall Tables from several localities on the Trent Watershed. Roy. 8vo. *Spons*. London. 1s. 6d.
- Military Prize Essay, 1879. Clayton (Captain Emilius). Field Intrenching; its Application on the Battlefield and its Bearing on Tactics. With Plates. 8vo. London. *W. Mitchell*. 2s. 6d.
- Mining, Mining Machinery and Coal. List of Books upon these subjects, *Henry Carey Baird & Co.* Philadelphia.
- Parks and Gardens of Paris. W. Robinson, F.L.S. With numerous illustrations. 8vo. *Macmillan*. London (cheaper issue). 18s.
- Railroad Accidents; Notes upon—, Charles Francis Adams, Jr. 12mo. New York. *Putnam's*. \$1.25.
- Rainfall—British, 1878. On the Distribution of Rain over the British Isles during the year 1878, as observed at about 2,000 Stations in Great Britain and Ireland. G. J. Symons. 8vo. London. *Stanford*. 5s.

Railway System.—The Index to our Railway System and our Leading Lines: A Comprehensive Analysis of Railway Property, 1878-79. No. 3. Wm. Fleming. London. 8vo. *McCorquodale*, 2s. 6d.

Sanitary Engineering. Report of the Proceeding of the District Meeting of Municipal and Sanitary Engineers and Surveyors held at the Town Hall, Wrexham, June 21st, 1879; Discussion on Shone's Patent Pneumatic Sewerage System. 4to. Discussion, fcap. *Brayley and Bradley* (Wrexham). Spons. London. 1s.

Science, Half-hour Recreations in Popular.—Second Series, uniform with the First Series, containing: Transmission of Sound by the Atmosphere, by John Tyndall; Gigantic Cuttle-Fish, by Saville Kent; The Glacial Epoch of our Globe, by Alexander Braun; The Sun and the Earth, by Prof. Balfour Stewart; The Ice Age in Britain, by Prof. Geikie; Plant Life in the Sea, by L. Kny; The Telephone and the Phonograph, by Prof. F. G. Garbit; The Use and Abuse of Food, Ozone, Dew; The Levelling Power of Rain, by Richard A. Proctor; The Succession of Life on the Earth, by Prof. W. C. Williamson; What the Earth is Composed of, by Prof. Roscoe; Notes on Tree Growth, by Prof. Asa Gray; Science and War, by H. Baden Pritchard; Existence of Glacial Action upon the Summit of Mt. Washington, N. H., by Prof. C. H. Hitchcock. One vol., large 12mo. Boston. *Estes & Lauriat*. \$2.50.

Sewerage. Discussions on Isaac Stone's Pneumatic Sewerage System, by Engineers, Surveyors and Medical Doctors, convened under the Auspices of the "Sanitary Register," held in the Town Hall, Wrexham, July 19, 1879, under the Presidency of Dr. Lory Marsh. Roy. 8vo. "*Guardian*." Office (Wrexham). Spons. London. 6d.

Sewers and drains of populous districts, by Col. J. W. Adams. New York. *Van Nostrand*. (Announcement.)

Thames Traffic. Report, evidence, maps. *British Govt. Publication*. London. 8s.

Thermodynamica. Prof. Henry T. Eddy. 18mo. (No. 45, Science Series). *Van Nostrand*. New York. \$0.50.

Tunneling—Practical Tunneling, explaining in detail the setting out works, shaft sinking, heading driving, ranging lines, leveling under ground, sub-excavating, timbering, construction of brickwork of tunnels, with labor required for and cost of various portions of the work. By Frederick Walter Simms, C. E. 3d ed., rev. and extended with chapters illustrating the recent practice at St. Gothard, Mt. Cenis and other modern works. By D. Kinnear Clark, C. E. 8vo, illus. *Van Nostrand*. New York. \$7.50.

Water—Analysis of Water. J. A. Wanklyn and E. T. Chapman. 5th ed., cr. 8vo. London. *Trubner*. 5s.

—Address upon Water Economy, delivered at the Anniversary Meeting of the Sanitary Institute, July 10th, 1879, His Grace the Duke of Northumberland in the chair. G. Symons. Cr. 8vo, pp. 23. *Stanford*. London. 1s.

—Power of Water. J. Glynn. New ed., 12mo. (Weales' series.) *Crosby Lockwood*. London. 2s.

—National Water Supply, Sewage and Health. Annual Conference, Society of Arts, Adelphi, held Thursday and Friday, the 15th and 16th May, 1879. Imp. 8vo. *Bell and Sons*. London. 1s. 6d.; 2s.

Wave and Vortex Motion. Thomas Craig. 18mo. (No. 43, Science Series). *Van Nostrand*. New York. \$0.50.

Weights; Tabulated Weights, of Angle, Tee, Bulb, Round, Square and Flat Iron and Steel, and other Information for the use of Naval Architects and Shipowners. By Chas. H. Jordan, Mem. Inst. N. A., Surveyor to the Underwriters' Registry for Iron Vessels. Third Edition, rev. and enl., royal 32mo, cloth. Spons. London. 2s. 6d.

Wood Engraving—Practical Hints. For the instruction of reviewers and the public. W. J. Linton. 4to. *Lee & Shepard*. Boston. \$0.50.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Administration des Ponts et Chaussées, Paris:
Annales. May, June and July, 1879.
List of Members Ponts et Chaussées.

From American Academy of Arts and Sciences, Boston:
Proceedings from May 1878 to May 1879.

From American Chemical Society, P. Cassatt, Major, Secretary, New York:
Proceedings of the Society. Vol. 1. Nos. 4 and 6.

From American Institute of Mining Engineers, Prof. Thomas M. Drown, Secretary, Easton, Pa.:
The Tassic Gas Producer. A. L. Holley.
On some curious phenomena in making a Test of Bessemer Steel. Wm. Kent.

Accidents in the Comstock Mines and their relation to deep mining. John A. Church.
On the use of determining Slag densities in Smelting. Thomas Macfarlane.

The Antimony deposits of Arkansas. Charles E. Wait.

Discussion of Charles B. Dudley's paper on Steel Rails, read at the Lake George Meeting, October, 1877. By R. W. Hunt, W. R. Jones, T. Egleston, A. L. Holley, W. Metcalf, Wm. Kent, D. Torrey, H. M. Howe, C. E. Stafford, R. W. Raymond, W. E. C. Coxe, A. S. McCreath and Wm. P. Shinn.

Notes on the Wear of Iron Rails. W. E. C. Coxe.
On an apparatus for Testing the resistance of metals to repeated shocks. Wm. Kent.

Pittsburgh—Its resources and surroundings. Wm. P. Shinn.

Proceedings of the Pittsburgh Meeting, May 13, 1879.

Regenerative Stoves, a sketch of their history and notes on their use. John M. Hartman. Sketches of the New Mining District at Sullivan, Maine. C. W. Kempton.

The working of the three Hearths at the Cedar Point Furnace, Port Henry, N. Y. T. F. Witherbee.

From George D. Analey, City Surveyor, Montreal:

Our Health and our Diseases; condition of Montreal in a Sanitary point of view. F. P. Mackelan, Montreal.

From Argentine Scientific Society, Don Felix Amoretti, Secretary, Buenos Ayres:

Annales, June and July, 1879.

From Board of Water Commissioners, Toronto, Canada:

Annual Reports of the Board for 1875, 1876, 1877 and 1878.

From Boston Public Library, Boston: Twenty-seventh Annual Report of Boston Public Library.

From Hon. Allan Campbell, New York: Report of the Department of Public Works, quarter ending March 31, 1879.

From E. S. Chesbrough, Chicago:

Third Annual Report Department of Public Works of Chicago.

From Civil Engineers' Club of the Northwest. L. P. Morehouse, Secretary, Chicago:

Proceedings of the Club.
Metric System.

Memorial of William H. Clarke.

Superstructure of the Glasgow Bridge.

Proposed Constitution and By-Laws by Committee on Reorganization.

From Prof. John Collet, Indianapolis, Ind.:

Eighth, Ninth and Tenth Annual Report of the Geological Survey of Indiana, made during the years 1876-77-78. E. T. Cox, Indianapolis, 1879.

From Joseph P. Davis, City Engineer, Boston:

Third Annual Report of the Boston Water Works.

From Maj. George W. Dresser, Secretary of Society of Gas Lighting, New York:

Transactions of the Society for 1877.

From Essayons Club, Corps of Engineers, U. S. A. W. M. Black, Secretary, Willets Point, N. Y.:

Papers read before the Club during the winter 1878-79, as follows: XLV, Useful Tables for finding Specific Gravity. Lieut.-Col. Heger. XLVI—Notes on the use of Logarithms. H. B. Palfrey. XLVII—Testing of medium and high tension fuses. Gen. Abbot.

From Desmond Fitzgerald, Brookline, Mass.:

Third Annual Report of the Boston Water Works.

From Charles E. Fowler, City Surveyor, Hartford, Conn.:

Annual Reports of the Street Department of the City of New Haven, for 1876, 1877, and 1878.

From the Imperial College of Engineering, Henry Dyer, Principal, Tokio, Japan:

Reports of the Principal and Professors from 1873 to 1877.

From the Imperial and Royal Legation of Austria:

Beiträge zur Beleuchtung der allgemeinen Verhältnisse der Oesterreichischen Eisenbahnen.

From the Imperial Technic Society, Prof. Paul Panayeff, Director, Moscow, Russia:

Notes of the Society. Part 6 (Russian).

From the Institution of Civil Engineers, James Forrest, Secretary, London:

Minutes of Proceeding. Vol. LVII.

List of Members of the Institution, July 2, 1879.

Abstracts of papers in foreign Transactions and Periodicals. Vol. LVII. Session 1878-79. Part 3.

Excerpt from Minutes of Proceedings. Edited by James Forrest, as follows:

Dioptric Apparatus in Lighthouses for the Electric Light. James T. Chance
The Electric Light applied to Lighthouse Illumination. James N. Douglas.

Description of Several Bridges erected in Switzerland. Jules Gaudard.

Description of Machinery for the production and transmission in the larger Factories of East Lancashire and West Yorkshire. George W. Sutcliffe.

Strength and elasticity of Materials. Wm. J. Millar.

Dock Gates. Adam F. Blandy.

The Improvement of the Bar of Dublin Harbor by Artificial Scour. John P. Griffiths.

A Search for the Optimum System of Wheel Teeth. Edward Sang.

Street Carriageway Pavements. George F. Deacon.

Wood as a Paving Material under Heavy Traffic. Osbert H. Howarth.

Discussion on the two foregoing subjects. Experiments on the Filtration of Water. George Higgins.

From the Iron and Steel Institute, J. S.

Jeans, Secretary, London:

Journal of the Institute, No. 1. 1879.

From Henry F. Kane, C. E., New York:

Address to the Members of the New York Exchange, by Henry F. Kane, On the Practicability of permanently maintaining several feet increased depth over the Sandy Hook Bar, and otherwise improving the Channel,

From Charles Latimer, Cleveland, O.:

The French Metric System, or the Battle of the Standards. (Several copies.)

From Hon. R. C. McCormick, Washington, D. C.:

Our Success at Paris in 1878. R. C. McCormick. New York, 1879.

From W. H. McFadden, Philadelphia:

Annual Report of the Chief Engineer of the Water Department of the City of Philadelphia for 1878.

From Midland Institute of Mining, Civil and Mechanical Engineers,

Joseph Mitchell, Secretary, Barnsley, England:

Transactions. November, 1878. February, March, May and July, 1879. Vol. VI, Part XLVI.

From New York Meteorological Observatory, Daniel Draper, Director, New York:

Abstracts of Registers from Self-Recording Instruments. June and July, 1879.

From North of England Institute Mining and Mechanical Engineers, Theo. Wood Bunning, Secretary, Newcastle-on-Tyne, England:

Transactions. April, May and June, 1879.

From the Publishers *Revue Générale des Chemins de fer*, Edgar Monjean, Secretary. Paris:

Revue Générale des Chemins de fer. May and June, 1879.

From Philadelphia and Reading Coal and Iron Co. Philadelphia:

Diagram and Tables showing the Annual Production of Anthracite Coal in Pennsylvania since 1820, and the amount produced from each region.

From Royal United Service Institution,

Capt. B. Burgess, Secretary, London: Appendix to Vol. XXII of the Journal of the Institution.

Vol. XXIII, Journal of the Institution, No. C. Extra number.

From Société des Ingénieurs Civils, M. Mallet, Secretary, Paris:

Mémoires de la Société. November and December, 1878. January, February, March and April, 1879.

From R. H. Thurston, Hoboken, N. J.: Friction and Lubrication. Prof. R. H. Thurston. New York, 1879.

Mechanical and Physical Properties of the Copper-Tin Alloys. Prof. R. H. Thurston. Washington, 1879.

From United States Light House Board, Washington, D. C.:

List of Beacons, Buoys, Monuments and other Day Marks in the First Light House District, corrected to July 1, 1879.

From Jerome B. Ward, Newark, N. J.: Report on Additional Water Supply for the City of Newark, N. J. By J. James K. Croes and George W. Howell. March 6th, 1879. (Several copies.)

From Hon. A. A. Wagstaff, New York: Annual Report of the Superintendent of Public Works, State of New York, for 1878. B. S. W. Clark.

Annual Financial Report of the Auditor of the Canal Department of the State of New York for 1878. G. W. Schnyder.

Second Annual Report of the Superintendent of State Prisons of the State of New York. Louis D. Pillsbury.

Report of the Board of Commissioners of Pilots, December 31st, 1878.

Communication from the Superintendent of State Prisons relative to the Contract System in the State Prisons. L. D. Pillsbury.

Communication from the Acting Chief of Engineers, U. S. A., relative to the Pier and Bulkhead Lines of New York Harbor. Gen. H. G. Wright.

A Proposed New City Park for the extreme Eastern portion of New York. Wm. J. Fryer, Jr.

The Necessity to Commerce of Cheap Water Communication between the West and East. An Address to the Farmers of Ohio, Indiana and Illinois.

From Gen. H. G. Wright, Chief of Engineers, U. S. A., Washington, D. C.: Reports upon the Specimens obtained from Borings made in 1874 between the Mississippi River and Lake Borgne, at the site proposed for an outlet for flood water. Prof. Eugene W. Hilgard and Dr. F. V. Hopkins.

On the Use of the Barometer on Surveys and Reconnaissances. Lieut. Col. R. S. Williamson.

Eleventh Report upon the Improvement of the South Pass of the Mississippi River. Capt. M. R. Brown. (Copies for distribution.)

From A. F. Wrotnowski, New Orleans: Topographical and Drainage Map of New Orleans and Surroundings.

ANNOUNCEMENTS.

At the meeting of the Society of October 1st, the paper by James D. Burr, member of the Society, subject, "The Construction of the Railroad over the Raton Mountains," will be read and discussed.

At the meeting of October 1st, the paper No. CLXXX (Transactions May 1879), on the Construction and Maintenance of Roads, by Edward P. North, member of the Society, and the discussions presented on the same at the Convention at Cleveland will also be considered and further discussed. Advance copies of these discussions will be furnished to persons desiring to discuss the subject.

At the meeting of October 15th, the paper by Max E. Schmidt, subject, "The South Pass Jetties," published in the current number of the Transactions, will be discussed.

Discussion on each of these subjects is especially invited. The Secretary will forward the advance copies to those who inform him of their desire to discuss. The discussions may be presented verbally or sent to the Secretary, who will read them for the authors.

The Twenty-seventh annual meeting of the Society will be held at its rooms in New York, on November 5th, 1879, at 10 A.M.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation

of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door from Fourth avenue, and near the southwest corner of

Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Thursday evening*, from 7½ to 10 P.M. Members are invited to avail themselves of the opportunities, afforded on Thursday evenings both for consultation of books and periodicals, and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

CUNNINGHAM, JAMES H.	Engineer and Proprietor, Milwaukee Bridge and Iron Works, Milwaukee, Wis.....	August 6, 1879.
FINNEY, FREDERICK N.	General Manager, Wisconsin Central Railroad, Milwaukee, Wis ..	Sept. 3, “
PROUT, HENRY G.	(Elected Associate, Nov. 6, 1872), 12 Barclay street, New York.....	“ “ “
TITLOW, JOHN M.	Ass't Engineer, Department of Surveys, E. Entrance, City Hall, Philadelphia, Pa.....	August 6, “

CHANGES AND CORRECTIONS.

MEMBERS.

ALLEN, C. FRANK	Engineers' office, New Mexico & Southern Pacific Rail- road, Las Vegas, New Mexico.
MORSS, FOSTER	Engineer Shenandoah Valley Railroad, Berryville, Va.
WHITNEY, JOSEPH	Cambridgeport, Mass.

JUNIOR.

LUCAS, D. JONES	Box 405, Lewiston, Maine.
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RESIGNATION.

STEELE, J. DUTTON September 5th, 1879.

DEATH.

COLBURN, WARREN Elected Member, March 18th, 1868. Died September 16th, 1879.



American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, October, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

OCTOBER 1ST, 1879.—The Society met at 8 P. M., William H. Paine in the chair. Ballots were canvassed, and Thomas M. Cleeman, of Philadelphia, Pa., and Irvin John, of New York, were declared elected members. The vote was canvassed on resolutions submitted to letter ballot, with the following result :

On the resolution :

Resolved, That a standing committee of seven, representing different sections of the country, be appointed from the American Society of Civil Engineers, who shall examine into the entire subject of the preservation of timber, and report to the Society from time to time, and who shall collect such samples and data as they may be able, to aid in determining the relative values of the different woods, both preserved and unpreserved, in ordinary use in various parts of the country.

There were 149 yeas and 7 noes.

This resolution was thereupon declared adopted.

On the resolution :

Resolved, That a committee of seven members of the Society be appointed by the Board of Direction to devise and report a uniform system for tests of cement.

There were 147 yeas and 9 noes.

This resolution was thereupon declared adopted.

The death, on September 16th, 1879, of Warren Colburn, member of the Society, was announced, and the Chairman was authorized to appoint a committee to prepare a memoir of the deceased.

The following amendments to the Constitution were submitted :

Amendment to Article XXII., proposed by William E. Worthen, L. B. Ward, Charles Macdonald, J. J. R. Croes, and Stevenson Towle :

At the end of Article XXII insert: "On and after the fifth day of November, 1879, Past Presidents of the Society shall be Life Members, entitled to all the privileges of members without the payment of Annual Dues.

Amendment to Article XXXIII., proposed by William P. Shinn, William Metcalf, Reuben Miller, C. Vandervoort Smith, and William H. Paine :

To amend Article XXXIII. so that the amended article shall read as follows :

ARTICLE XXXIII.—Proposed amendments to this Constitution must be submitted in writing, signed by not less than five members, on or before the first Wednesday in October, and then sent by letter to the several members of the Society, at least twenty-five days previous to the Annual Meeting. Such amendments shall be in order for discussion and amendment at such Annual Meeting, and with such amendments thereto as may have been approved by a majority vote of the Annual Meeting, shall be voted upon by letter ballot, the vote to be counted at the first regular meeting in February. An affirmative vote of two-thirds of all ballots cast shall be necessary to secure the adoption of any amendment.

The words in italics constitute the proposed amendment ; otherwise the article is unaltered.

These amendments will be in order for discussion at the Annual Meeting, and afterwards will be voted upon by letter ballot.

The discussion on the paper by Edward P. North on "Construction and Maintenance of Roads" was resumed and participated in by E. B. Van Winkle, J. J. R. Croes, E. R. Andrews, E. Yardley, J. C. Post, and E. P. North.

A paper by James D. Burr, subject "The Construction of the Atchison, Topeka & Santa Fe Railroad over the Raton Mountains, and the performance of Locomotives on its steep grades," was read by the Secretary and discussed by J. Foster Flagg (by letter), E. Yardley, C. E. Emery, and E. P. North.

OF THE BOARD OF DIRECTION.

AUGUST 4TH, 1879.—Applications for membership were considered.

SEPTEMBER 2D, 1879.—Applications for membership were considered. The Board of Censors to award the Norman Medal for the present year were appointed as follows : E. S. Chesbrough, Charles Paine, and C. Shaler Smith. Resolutions for appointment of standing committees were considered and ordered to be submitted to vote by letter ballot. Financial matters and arrears due from members were considered, and appropriations were made.

OCTOBER 1ST, 1879.—Applications for membership were considered. The distribution and exchange of publications were acted upon. The

publication of a Society paper in a journal, without giving credit to the Society, was brought up, and action taken, Preparation was made for the Annual Report of the Board. The report of the Nominating Committee was received, and it was ordered that a ballot should be prepared and issued in accordance with the By-Laws. Appropriations were made.

THE NORMAN MEDAL.

The following rules have been adopted by the Board of Direction, with the approval of the donor of the Medal Fund, George H. Norman, Member and Fellow of the Society:

CODE OF RULES

FOR THE

AWARD OF THE NORMAN MEDAL.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon \$1,000 00 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent, or industry displayed in the consideration of the subject treated

of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting in November.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

ADDITIONS TO LIBRARY AND MUSEUM.

From Administration des Ponts et
Chaussées, Paris :
Annales. August, 1879.

From American Chemical Society, P.
Cassamajor, Secretary, New York :
Journal of the Society. Vol. 1. No. 7.

From Argentine Scientific Society, Don
Felix Amoretti, Secretary, Buenos
Ayres :
Annales. August, 1879.

From Hon. Allan Campbell, New York :
Report of the Department of Public Works of
the City of New York, for the quarter ending
June 30, 1879, with special report on the
subject of Water Supply.

From O. Chanute, New York :
Blue and white Tracings of Sample Test Bars.
Records of Tests, Iron and Steel, N. Y. L.
E. and W. R. E. (Several copies.)

From Theodore Cooper, New York :
Report of the proceedings of the Inter-oceanic
Canal Congress, held at Paris, May, 1879,
and instructions given to Daniel Ammen
and Civil Engineer A. G. Menocal, U. S. N.

From Department of the Interior,
Washington, D. C. :
Report of the Commissioner of Education for
the year 1877. (Two copies.)

From Charles E. Fowler, New Haven,
Conn. ;
City Year Book of New Haven, containing
List of officers, messages of the Mayor,
Reports of Departments, Public Documents
and Miscellaneous papers from 1876 to
1878.

From George H. Frost, New York :
A comprehensive Treatise on the Water Sup-
ply of Cities and Towns. William Hum-
ber.

From E. T. Hall, New York :
*Bulletin of the American Geographical So-
ciety.* No. 4. 1878.

From Julius E. Hilgard, Assistant in
charge United States Coast Survey,
Washington, D. C. :
Report on Inter-oceanic Canals and Railroads
between the Atlantic and Pacific Oceans.
Charles H. Davis.
Methods and results—secular change of Mag-
netic Declination in the United States and
at some foreign stations. Third edition.

From the Institute for the advancement
of Technical Education, London,
Programme of Technological Examinations
for 1880.

From the Institution of Civil Engineers,
James Forrest, Secretary, London :
Charter, By-Laws and Regulations, and List
of Members, Institution of Civil Engineers,
August 2d, 1879.

Minutes of Proceedings. Vol. LVIII.
Abstracts of Papers in foreign Transactions
and Periodicals. Vol. LVIII.

Session 1878-79. Part 4.
Excerpt from Minutes of Proceedings. Edited
by James Forrest, as follows :

Description of a New Balance Bridge over
the Royal Canal at Dublin. Bindon B.
Stoney.

On Keeping Irrigation Canals clear of
Silt. R. B. Buckley.

On the Street and Footwalk Pavements of
Montreal, Canada, from the year 1842 to
1878. Percival W. St. George.

The Travelling of Sea Beaches. George
U. Kinahan.

From the Institution of Mechanical
Engineers, W. R. Browne, Secretary,
London :
Proceedings of the Institute. June, 1879.

From M. Fero de Lesseps, Paris, France:
Proceedings of the International Congress on
the Inter-oceanic Canal, held at Paris, May
16th to May 29th, 1879 (French).

The reality of a Ship Canal across the Isthmus
of Panama. Lucien de Puydt (French).
International Company of the Columbian
Ship Canal, founded in Paris, March 9th,
1864. Organized for the purpose of cutting
a Ship Canal on a level without Locks or
Tunnels, across the Isthmus of Darien.

From G. A. M. Liljencrantz, Chicago:
America's Climate. Graphical illustrations
of the Daily Variations of Temperature for
one year, from July 1, 1878, to June 30,
1879. Sheets 1 and 2. G. A. M. Liljencrantz,
O. E.

From E. P. Lull, Commander U. S. N.,
Washington, D. C.:
Reports of Explorations and Surveys for the
location of a Ship Canal between the At-
lantic and Pacific Oceans, through Nica-
ragua. 1872-73.

From the National Board of Health,
Washington, D. C.:
Schedules of Questions for a Sanitary Survey
of a City or Town.

From Simon Newcomb, Supt. American
Ephemeris and Nautical Almanac,
Washington, D. C.:

Astronomical Papers, prepared for the use of
the American Ephemeris and Nautical Al-
manac. Vol. I, Part I. Tables of Eclipses.

From New York Meteorological Observa-
tory, Department Public Parks, Daniel
Draper, Director, New York:

Abstracts of Registers from Self-Recording
Instruments. August, 1879.

From Charles Paine, Cleveland, Ohio:
Proceedings of Civil Engineers of the North-
west. August 6th, 1879.

Letter objecting to the proposed Constitution
of Civil Engineers' Club of the Northwest.

From Ernest Poutzen, Paris, France:
Le Verre Trempé.

From the Royal Technical High school,
Hanover, Germany:
Prospectus for 1879-80 (German).

From W. H. Schock, Engineer-in-Chief
U. S. N. Bureau of Steam Engineer-
ing, Washington, D. C.:

Annual Report of the Chief of the Bureau of
Steam Engineering.

Report on the Herreshoff Boiler, submitted to
the Navy Department January 12th, 1878.

Report of the Board to recommend a Stan-
dard Gauge for Bolts, Nuts, and Screw
Threads for the United States Navy. May,
1878.

Speed Co-efficients of Screws of Vessels in the
United States Navy.

Power Co-efficients of Engines of Vessels in
the United States Navy.

Report on the two kinds of Coal submitted by
the Chesapeake and Ohio Railroad Co.
Iron Manufacturers in Great Britain. Prof.
E. H. Thurston.

Report on the Ashcroft Furnace Doors and
Grate Bars.

Report on the Murphy Grate Bar.

Report on D. C. Green's System of Ventilation.

Report on Safety Valve Tests made at the
United States Navy Yard, Washington, D.
C., September, 1875.

From Société des Ingénieurs Civils, M.
Mallet, Secretary, Paris, France:
Mémoires de la Société. May and June, 1879.

From United States Light House Board,
Washington, D. C.:

List of Towers, Beacons, Buoys, Stakes and
other Day Marks in the Seventh Light
House District. Corrected to July 1, 1879.
(Two copies)

From E. B. Van Winkle, Topographical
Engineer, Department Public Parks,
New York:

Conditions of proposals for Constructing
Sewer and Appurtenances in 134th Street,
from 410 feet East of Willis Avenue to
Brook Avenue, with Branch in Brown
Place.

Conditions of proposals for Constructing
Sewer and Appurtenances in 141st Street,
from Alexander Avenue to Brook Avenue,
with Branches in Alexander Avenue and
Willis Avenue.

Form of agreement in Triplicate for the Con-
struction of Drains on and for the Lands
bounded by George Street on the north,
Union Avenue and White's Lane on the east,
Delmonico and Concord Avenues on the
west, and thence southerly to Long Island
Sound, in the 23d Ward of the City of New
York.

From George E. Waring, Jr., New-
port, R. I.

Excremental Diseases: Their causation and
their prevention by Hygienic means.
George E. Waring, Jr.

From A. B. Whitney, New York:

Two framed Photographs of the Third Avenue
Elevated Railroad.

From the World's Fair Committee for
1883, W. H. C. Price, Secretary, New
York:

The World's Fair Committee for the proposed
World's Fair in the City of New York for
1883.

Address of the Committee to the people of
the United States.

From Gen. H. G. Wright, Chief of En-
gineers, U. S. A., Washington, D. C.:
Official Army Register for 1879.

From other sources;
The American Catalogue, Vol. 1, Authors and
Titles; Part 4. Robbie—Z.
On the Molecular Changes produced in Iron
by variations of temperature. Prof. R. H.
Thurston.

New York Ore Separator Company.

The Manufacture of Steel. M. L. Gruner.

Railway Gauge, from the *London Times* of
January 17th, 1873.

Proceedings of the National Narrow Gauge
Railway Convention, held at St. Louis, Mo.,
June 19th, 1872.

A letter to the Rt. Hon. H. C. E. Childers, M.
P., on Railway Gauges. W. W. Evans.

A letter on the Railway Gauge question, by B.
H. Latrobe, with extracts from English
Engineers' reports to the British Govern-
ment on Railway Gauges, published by W.
W. Evans.

The Street Railroads of the City of New York.
Railway Rolling Stock and discussion by W.
R. Browne and W. A. Adams.

Time Tables, London, Chatham and Dover
Railway, August, 1878.

Time Tables of London and Northwestern
and other railways in connection, January,
1879.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

CLEEMANN, THOMAS M.....	340 South Twenty-first street, Philadelphia, Pa.....	October 1st, 1879.
LEHNARTZ, FREDERICK W...	United States Engineer's Office, Cascade Locks, Owasco Co., Oregon.	August 6, 1879.

CHANGES AND CORRECTIONS.

MEMBERS.

BILLIN, CHARLES E.....	Pencoyd Iron Works, 265 South Fourth street, Philadelphia, Pa.	
FALCONNET, E. F.....	Chief Engineer, Owensboro and Nashville Railroad, Nashville, Tenn.	
FUNIAK, FRED. DE.....	General Manager Louisville and Nashville Railroad, Louisville, Ky.	
JAMES, JOHN C	Chief Engineer Northwestern Grand Trunk Railroad, Battle Creek, Mich.	
NICHOLS, O. F.....	25 Wall street, Trenton, N. J.	
PONTZEN, ERNEST.....	4 Rue de Castellane, Paris, France.	
STAUFFER, D. MC. N.....	129 South Thirteenth street, Philadelphia, Pa.	
STEPHENS, CLINTON F.....	Resident Engineer, Texas and St. Louis Railroad, Texarkana, Ark.	
YARDLEY, EDMUND.....	104 East 20th Street, New York.	

ASSOCIATE.

HARRIS, CHARLES M.....	83 Cedar street, New York.
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JUNIOR.

FRANCIS, HENRY N.....	City Hall, Providence, R. I.
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DEATHS.

VINTON, FRANCIS L.....	Elected Member August 5th, 1868.	Died October 6th, 1879.
TASKER, CHARLES A.....	Elected Junior, November 4th, 1874.	Died October 4th, 1879.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V, November, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

OCTOBER 15TH, 1879.—The Society met at 8 P. M., Walter Katté in the chair. The paper by Max E. Schmidt, subject "The South Pass Jetties," published in Transactions for August, 1879, was discussed by J. Foster Flagg (by letter), and by Messrs. E. R. Andrews, O. Chanute, T. Cooper, W. Katté, T. J. Long, E. P. North and J. W. Putnam.

NOVEMBER 5TH, 1879.—THE TWENTY-SEVENTH ANNUAL MEETING OF THE SOCIETY.—The Society met at 10 A. M., Vice President Albert Fink in the chair. The following members were present :

Messrs. Edward R. Andrews, George S. Baxter, John Bogart, Robert Briggs, O. Chanute, E. S. Chesbrough, Thomas C. Clarke, F. Collingwood, Theodore Cooper, Martin Coryell, J. J. R. Croes, Wilson Crosby, D. W. Cunningham, E. B. Dorsey, G. W. Dresser, Theodore G. Ellis, Charles E. Emery, Albert Fink, Clark Fisher, Edward A. Flint, A. Gordon, Bryant Godwin, G. Thomas Hall, Sullivan Haslett, A. L. Holley, William E. Kelley, George O. Knapp, Charles Latimer, G.

Leverich, W. W. Maclay, Edward Marsland, Charles C. Martin, Charles L. McAlpine, D. N. Melvin, William Metcalf, W. A. Nichols, Edward P. North, F. O. Norton, William H. Paine, Franklin C. Prindle, C. Vandervoort Smith, George C. Tingley, E. B. Van Winkle, W. W. Wilson, De Volson Wood, William E. Worthen and W. W. Wright.

George W. Dresser and Theodore Cooper were appointed Tellers of the ballots for officers.

The Annual Report of the Board of Direction was then presented, read by the Secretary, and on motion was accepted.

The Annual Report of the Treasurer was presented, read and accepted.

The Annual Report of the Finance Committee was presented, read and accepted.

The Report of the Library Committee on the subject referred to it at the last Convention, namely, whether some plan may not be adopted to enable members living away from New York to consult the books of the Library, under proper regulations to ensure their return and to prevent injury, was then presented, read and accepted.

A report from the Committee on Gauging of Streams was then read, accepted, and the Committee continued.

The Secretary presented a statement of the answers to the circular requesting suggestions as to the time and place for the next Annual Convention. After discussion, it was resolved that there should be issued to the Society a circular giving an abstract of the suggestions made on the subject, and that the determination of the place for the Convention should be submitted to letter ballot, restricting the vote to the three cities already suggested by the largest number of members, namely, St. Louis, Washington and San Francisco.

The Report of the Committee on the Exhibit of American Engineering at the Paris Exposition was then presented, read by Edward P. North, accepted, and the Commission discharged.

A report from the Centennial Commission of the Society was then presented by the Chairman, Theodore G. Ellis, to the effect that the Commission had been continued from year to year, in the hope that the Chairmen of the Sub-Committees, on various divisions of Engineering Exhibits would prepare reports. Only two, however, had been presented, those on Lighthouses and on Rivers and Harbors, and as there was no probability of further reports, the Commission asked to be discharged. The report was accepted and the Commission discharged.

The Committee on Method of Nominations then presented a verbal report through the Chairman, J. J. R. Croes. On motion, it was resolved that the Committee be continued, and that the former report made by it be printed and sent to the members of the Society for discussion and suggestion.

The Committee on Quarters for the Society presented a report, which was, on motion, accepted, the Committee continued, and instructed to

report, as soon as practicable, by letter to the Society, what was considered a feasible plan for procuring a suitable building to belong to the Society.

The tellers of the ballots for officers then reported the canvass of the votes, and the following named members were declared elected officers of the Society for the ensuing year : President, Albert Fink ; Vice-Presidents, James B. Francis and Octave Chanute ; Secretary and Librarian, John Bogart ; Treasurer, J. James R. Croes ; Directors, William H. Paine, C. Vandervoort Smith, Charles Hermany, Edgar B. Van Winkle and Gouverneur K. Warren.

The following proposed Amendment to Article XXII. of the Constitution was considered :

At the end of Article XXII, insert: "On and after the fifth day of November, 1879. Past Presidents of the Society shall be Life Members, entitled to all the privileges of members without the payment of Annual Dues."

After discussion, it was resolved that this proposed amendment be submitted to letter ballot without comment.

The following proposed Amendment to Article XXXIII. of the Constitution was considered :

To amend Article XXXIII, so that the amended article shall read as follows :

ARTICLE XXXIII.—Proposed amendments to this Constitution must be submitted in writing, signed by not less than five Members on or before the first Wednesday in October, and then sent by letter to the several Members of the Society, at least twenty-five days previous to the Annual Meeting. Such amendment shall be in order for discussion and amendment at such Annual Meeting, and with such amendments thereto as may have been approved by a majority vote of the Annual Meeting, shall be voted upon by letter ballot, the vote to be counted at the first regular meeting in February. Any affirmative vote of two-thirds of all ballots cast shall be necessary to secure the adoption of any amendment.

The words in italics constitute the proposed amendment ; otherwise the article is unaltered.

After discussion, it was resolved that the proposed amendment be approved by this meeting.

The result of the canvass of the ballots for membership was then announced, and the following candidates were declared elected members: Daniel Bontecou of New York, Alexander Dempster of Pittsburgh, Pa., Horace Loomis of New York, and James Hart Reno of Pittsburgh, Pa.

The suggestion made in the report of the Board of Direction as to the advisability of changing the day of the Annual Meeting and the date of termination of the Society year was discussed, and the Secretary was requested to present the subject for discussion at the next Convention.

On motion, the thanks of the Society were presented to the officers for the past Society year.

The Board of Censors to award the Norman Medal and Book Prize then presented its report through E. S. Chesbrough.

THE
ANNUAL REPORT OF THE BOARD OF DIRECTION,
FOR THE YEAR ENDING NOVEMBER 5, 1879.

PRESENTED AND ACCEPTED AT THE ANNUAL MEETING OF THAT DATE.

The Board of Direction presents the following Report for the term from November 6th, 1878, to November 5th, 1879 :

On November 6th, 1878, the membership in the Society was—

Honorary Members, resident, 2 ; non-resident, 4 ; Total.....	6
Corresponding Members,....	3
Members, resident..... 120	334
Associates, " 4	13
Juniors, " 8	49
Making	537
Fellows, 67—of whom 10 Members and 1 Honorary Member are included above, leaving.....	56
Total connected with the Society November 6th, 1878.....	593

At the present time the membership is—

Honorary members, resident, 2 ; non-resident, 4 ; total.....	6
Corresponding Members....	3
Members, resident..... 119	345
Associates, " 5	13
Juniors " 8	46
Making.....	545
Fellows, 67—of whom 10 members and 1 Honorary Member are included above, leaving.....	56
Total connected with the Society November 5th, 1879.....	601

The increase during the year has been—

Members admitted	28
Associates admitted.....	2
Juniors admitted.....	3
Fellows admitted	1
Total increase.....	34

The decrease during the year has been—

Members died..... 8 ; resigned..... 10	
Associates " —	Transferred to Members. ... 1
Juniors " 1	" " 5
Fellows " 1	" " —
Total died.... 10 ; resigned..... 10 ; transferred	6

On November 6th, 1878, there were, as stated in the last annual report, 6 proposals pending ; 44 proposals have been received during the year ; 31 candidates have been elected members, of whom 5 were transferred from Juniors

and 1 from Associates; 2 candidates have been elected as Associates, and 3 candidates have been elected as Juniors; 28 persons have qualified during the year as Members, 2 as Associates, 3 as Juniors, and 1 as Fellow; 3 candidates elected as Members during the year have not yet qualified; there are 13 proposals now pending.

23 meetings of the Society were held during the year, one of which was the Eleventh Annual Convention; all the sessions of the Convention, including the business meeting, being counted as one meeting of the Society. Meetings have been held on the first and third Wednesdays of each month, except the third Wednesday of August. 13 meetings of the Board of Direction have been held during the year.

The Eleventh Annual Convention was held at Cleveland, Ohio, June 17th, 18th, and 19th, 1879. During this time and after the close of the Convention, many works of engineering interest were visited both in Cleveland and its immediate vicinity, and also at Leavittsburgh, at the Mahoning Valley coal-fields, at Youngstown, Pittsburgh, the Davis Island dam, the Edgar Thomson Steel Works, the Bradford oil district, and at Niagara Falls. Full reports of the Convention have been published in the Proceedings.

The answers to a circular issued to the Society, requesting suggestions as to the place and time for the next convention will be submitted at this meeting.

Reports made during the year have been as follows:

By the Board of Direction.—The Annual Report for the year; also a report as to the publication of papers, a report as to arrears of dues from members, and a report as to designation of engineers to attend turbine tests at Holyoke.

By the Finance Committee.—2 reports.

By the Library Committee.—A report, embodying the changed rules for the award of the Norman Medal.

By the Treasurer.—His annual report, and also frequent financial statements to the Board.

By the Secretary.—Monthly Reports to the Board.

By the Centennial Commission of the Society.—1 report.

By the Committee on Exhibit at Paris.—2 reports.

By the Committee on Tests of American Iron, Steel, and Other Metals.—2 reports.

By the Committee on Gauging of Streams.—1 report.

By the Committee on Quarters for the Society.—1 report.

By the Committee on Uniform System of Railroad Accounts.—2 reports.

By the Committee on the Resistances of Railway Trains.—1 report.

By the Committee on Method of Nominations.—1 report.

The Treasurer's Report and the Report of the Finance Committee will be submitted at this meeting.

At the last annual meeting, the Committee on Resistances of Railway Trains made a final report, and asked to be discharged, which was done.

At the last convention the Committee on Uniform Accounts and Returns of Railroad Companies made a final report, and asked to be discharged, which was done.

The other committees referred to in the last report of the Board are still existing, and reports will be expected from them at the present annual meeting. These are the Centennial Commission of the Society; the Committee on Tests of American Iron, Steel, and Other Metals; on Gauging of Streams; on Quarters for the Society; on Methods of Nominations; and on the Exhibition at Paris.

PRESENTED AND ACCEPTED AT THE ANNUAL MEETING OF THAT DATE.

On November 6th, 1878, the membership in the Society was—

At the present time the membership is—

The increase during the year has been—

The decrease during the year has been—

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and 1 from Associates ; 2 candidates have been elected as Associates, and 3 candidates have been elected as Juniors ; 28 persons have qualified during the year as Members, 2 as Associates, 3 as Juniors, and 1 as Fellow ; 3 candidates elected as Members during the year have not yet qualified ; there are 13 proposals now pending.

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By the Committee on Tests of American Iron, Steel, and Other Metals.—2 reports.

By the Committee on Gauging of Streams.—1 report.

By the Committee on Quarters for the Society.—1 report.

By the Committee on Uniform System of Railroad Accounts.—2 reports.

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Resolutions were offered at the last Annual Convention for the appointment of a Committee on the Preservation of Timber, and a Committee on a Uniform System for Tests of Cement.

These resolutions have been submitted to letter ballot, and approved. The Board is now in correspondence with members in reference to the persons to serve on these committees.

At the Annual Convention the following resolution was adopted:

"That the Library Committee be requested to report whether some plan may not be adopted to enable members living away from New York to consult the books of the Library, under proper regulations to insure their return, and to prevent injury."

The Library Committee will report on this subject at this meeting.

A list of the papers and discussions published during the year, also of those presented in addition to those published, and also of the contents of Proceedings, will be given in an Appendix.

The library has been increased during the year by the following additions:

Number of Books, bound.....	78
" " unbound.....	102
" Pamphlets.....	387
" Maps.....	9
" Plans.....	15
" Photographs.....	30
" Drawings, Specifications, Models and Specimens.....	38

These do not include the magazines and papers contributed to the Society by publishers or received in exchange for the Transactions, a list of which is given in an appendix.

The present state of the Library is about as follows:

Books and Pamphlets.....	8,054
Manuscripts.....	93
Maps, Plans, Drawings, Charts, Photographs and Engravings.....	1,966
Models and Specimens.....	218

At the last Annual Meeting a codification of the Constitution and By-Laws, together with a number of proposed amendments were discussed. These were afterwards submitted to a letter ballot of the Society and the Constitution and By-Laws, as finally adopted, have been printed in pamphlet form.

Two amendments have been submitted for debate at the present Annual Meeting, one relating to the Past Presidents of the Society, and the other relating to the method of amending the Constitution.

In this connection, it has been suggested by a number of members, that the date of the Annual Meeting is particularly inconvenient, coming, as it does, the day after the date of the elections in quite a number of States. The Secretary has been informed by several members that their attendance at that day would be inconvenient, and in some cases, impracticable, and a change in the date of the Annual meeting might be discussed, and a more desirable day suggested.

The Board suggests that the fiscal year shall end on December 31st; that the Annual Meeting, election of officers and reception of reports be held on

the 3d Wednesday of January, and that the term of office should begin on the day of election.

In the last Annual Report the Board called attention to the large number of members in arrears for their dues. In its judgment the interests of the Society demanded that measures should be taken to determine whether the dereliction was due to inability to pay or to indifference, and if the latter was the cause, that the connection of the delinquents with the Society should cease. In accordance with these views, the Board, on April 30th, in compliance with the provisions of the Constitution, passed the following resolution :

"*Resolved*, That the Secretary be directed to notify all members in arrears " that unless the dues for the current Society year, beginning November 6th, " 1878, are paid before November 5th, 1879, they will cease to be members.

" Also, that members who are in arrears for more than the dues for the " current year, be notified that their dues for years previous to the current " year are still to be paid, and that payment of the same will be required, " unless good reason to the contrary, in compliance with the provisions of " Article XXXII of the Constitution, be assigned before November 5th, 1879."

In accordance with this action, there were sent, on May 1, 1878, to each member whose dues were not then paid, a copy of the above resolution, the formal notice (Form C) prescribed by the Constitution for use in case of non-payment of dues and a copy of the Articles of the Constitution relating to this subject.

Since that time a number of members have paid their dues in full ; others have paid the dues for the past year only, thus retaining their membership under the resolution quoted above; others have written in reply expressing their intention or desire to pay as soon as possible, and a large number have made no response whatever.

The necessity of preparing this report previous to the Annual Meeting and the probability that a number of members may give attention to this matter at the time of the meeting, prevents the Board from giving a final statement on the subject. After this meeting a full statement will be prepared and presented in a future report. It is apparent, however, that there will be quite a number of members whose names have been on the roll of the Society for some time past, whose membership will cease.

While the Board regrets the apparent decrease in membership, caused by this action, it feels that it is necessary to the prosperity of the Society that it should be distinctly understood that membership of the Society carries with it the obligation to contribute to its support, and that members cannot be carried on its rolls unless they bear their burdens equally with their fellows.

The subject of the conditions of award for the Norman Medal has been carefully considered by the Library Committee and by the Board and the donor of the medal, Mr. George H. Norman, member and Fellow of the Society, has been fully consulted.

No paper was presented in competition for the medal either the last or the present year, and it was felt to be for the best interests of the Society and due also to the donor of the medal that a different plan for its award should be adopted.

With his full concurrence the code of rules for this award has been modified, and competition is now extended to all papers conforming to the rules, presented to the Society during each year. The modified rules have been published for several months with the Proceedings. The Board of Censors to award the medal for this year, Messrs. E. S. Chesbrough, Charles Paine and C. Shaler Smith are expected to report at this meeting.

The Board has issued a list of topics upon which original papers, illustrating the experience of the writers, are requested. The attention of members of the Society is called to the great desirability of the presentation of papers by them upon subjects of engineering interest. Discussions of the papers presented are also in many cases essential to a full development of professional information on the subjects of those papers. Early information is now given, by notification to the members, of the papers to be read at each meeting and advance copies are sent to such members as are designated by the authors of the papers as specially qualified to take part in the discussions, and also to other members who desire such advance copies. The result of this practice has been not only to secure more extended discussion, but also to have the paper and its discussions presented at the same time, the Secretary reading the discussions sent him by persons not able to be present.

The Transactions of the Society are now issued up to date, the Number for October, 1879, having been sent out some time since. At the time of the last Annual Report one year ago, the Transactions were much behind. The reasons, altogether financial, for that state of things were explained in that Report. It has been found possible during the past year to publish not only the twelve monthly Numbers, but enough in addition to bring the issues to date in their regular sequence. This has added considerably to the labor of editing and supervising the publications, but it is the belief of the Board that with the systematic and business-like management of the financial affairs of the Society now in operation the future issues of its publications can be regularly made.

In but one previous year of its history has the Society lost so many of its members by death. The decease of eight members, one Junior and one Fellow, is announced, as follows :

Alfred W. Craven, Past-President and one of the original incorporators of the Society, November 5th, 1852, died March 27, 1879.

Robert G. Hatfield, elected Member December 4, 1867, who died February 15, 1879.

Warren Colburn, elected Member March 18, 1868, who died September 16, 1879.

Samuel J. Reeves, elected Member April 15, 1868, who died December 15, 1878.

Francis L. Vinton, elected Member August 5, 1868, who died October 6, 1879.

Norman A. Williams, elected Member February 17, 1869, who died October 12, 1879.

Franklin A. Stratton, elected Member May 3, 1876, who died July 17, 1879.

James E. Bell, elected Member March 5, 1879, who died June 8, 1879.

Charles A. Tasker, elected Junior November 4, 1874, who died October 4, 1879.

Thomas T. Tasker, Jr., elected Fellow January 7, 1873, who died August 19, 1877.

Memoirs of each are in preparation and will be published directly.

Respectfully submitted,

JOHN BOGART,
Secretary.

REPORTS OF COMMITTEES

PRESENTED AT THE ANNUAL MEETING, NOVEMBER 5TH, 1879.

ON METHODS OF NOMINATION FOR OFFICERS.

The following report was first presented at the Annual Meeting, November 6th, 1878. The Committee also at the Annual Meeting, November 5th, 1879, made a verbal report. It was then resolved that the Committee be continued, the report printed and issued to the Society for discussion and suggestion.

REPORT.

The Committee appointed at the regular meeting held during the Annual Convention, in June, 1878, to examine the methods of nominations for officers practiced by various societies and clubs, and to report a by-law embodying such features of the same as may seem best adapted to the use of this Society, respectfully report that they have performed the duty assigned them, and they present the following synopsis of the usages of ten associations, and also a plan proposed by a member of the Society. The existing by-law of the Society is appended for comparison.

The Institution of Civil Engineers, London :

17 Honorary Members, 1 148 Members, 1 200 Associate Members, 622 Associates.

President, 4 Vice-Presidents, and 12 members and 3 associates form the Council. (20 in all.)

Council elected annually.

President shall not serve more than 2 consecutive years, and then is not eligible for 3 years.

Senior Vice-President to be nominated for President unless he gives notice of intention to decline.

At the general meeting on the Tuesday before the Annual Meeting, the Council present a list of persons whom they nominate as suitable for offices. The list shall contain the names of 23 members and 6 associates.

The names presented (except for President and Vice-Presidents) shall be arranged alphabetically.

In voting this ballot, members may erase and substitute names, but the total number of names left must not exceed the number to be elected.

At the Annual meeting, the meeting chooses 2 scrutineers. The ballot is kept open for 1 hour.

The treasurer, secretary and other executive officers are appointed annually by the Council.

The Society of Engineers, London :

372 members.

The officers elected at the General Meeting in December.

The year of office begins on January 1st.

Council consists of—President, 3 Vice-Presidents, 8 members, 1 Honorary Secretary and Treasurer elected at the Annual Meeting. Also 6 Past Presidents who retire by seniority.

Members of Council are eligible for re-election.

The Council prepare a balloting list of proposed new Council and officers which shall be sent to each member who has paid his subscription for the current year, at least fourteen clear days before the date of the annual meeting.

Any member offering himself or proposing other members for election on the council must give in his or their names to the council on or before the first ordinary meeting in November. Such names shall be appended to the list proposed by council.

Members may erase and substitute.

At the annual meeting the President appoints 2 scrutineers.

In case of a tie, election to be decided by lot.

North of England Institute of Mining and Mechanical Engineers.

4 classes of members—Original. 750; ordinary, 17; associate, 12; honorary, 24; total, 803 members: students, 151.

Officers other than Secretary and Treasurer are elected from the original, ordinary and associate members, and consist of a President, six Vice-Presidents and eighteen Councillors, who with the Treasurer and Secretary constitute the council.

The President, Vice-Presidents and Councillors are elected at the Annual Meeting in August, and are eligible for re-election, with the exception of any President or Vice-President who shall have held office for three immediately preceding years, and such six councillors as may have attended the fewest council meetings during the past year.

The Treasurer and the Secretary are appointed by the Council and are removable by the Council subject to appeal to a general meeting.

Each member is at liberty to nominate in writing, and send to the Secretary not less than eight days prior to the ordinary general meeting in June, a list duly signed of members suitable to fill the offices—for the ensuing year.

The Council prepares a list of the persons so nominated, together with the names of the officers for the current year eligible for re-election, and of such other members as they may deem suitable. Such list must comprise at least 30 names. The list so prepared is submitted to the June meeting, and is the balloting list for August.

A copy of this list is posted to each member who may erase and substitute names, but names left must not exceed number to be elected.

The Chairman of the Annual Meeting appoints 4 scrutineers who receive the balloting papers, and after scrutiny destroy the same, and sign and hand to the Chairman a list of the elected officers.

Balloting papers may be sent by mail to Secretary or Chairman.

All Past Presidents are *ex-officio* members of Council, and Vice-Presidents who retire shall be *ex-officio* members for the following year.

Institution of Civil Engineers of Ireland.

148 members.

Officers: President, two Vice-Presidents, Honorary Secretary, and eight other members, who constitute the Council.

The President is not eligible for more than two years, and on vacating becomes an *ex-officio* member of Council. One Vice-President and two members of Council retire each year, but are re-eligible after one year.

Two members of Council are elected from the Associates. At the ordinary general meeting in December, the Council present a list of persons whom they nominate. Members may erase and substitute, leaving, however, twelve names. Lists containing more or less than twelve names to be rejected.

The meeting chooses two Scrutineers.

American Institute of Mining Engineers.

784 members.

Nominations may be sent in writing to the Secretary, accompanied with the names of the proposers, at any time not less than thirty days before the Annual Meeting. Two weeks before said meeting, the Secretary mails to every member the list of all nominations received. Voters may substitute, but the number of names voted shall not exceed number of officers to be elected.

At the Annual Meeting, three Scrutineers appointed by presiding officer.

Persons who have received the greatest number of votes are elected.

Union League Club, New York.

Annual Meeting held in January. Polls for election opened at 6:30 P. M., and open three hours.

At monthly meeting in December, a committee of seven, appointed by the Club at large, who shall report list of candidates.

Four inspectors and canvassers of election appointed by Club.

New York Club.

At Annual Meeting the Club ballots for officers. The presiding officer appoints three inspectors.

Candidates receiving the highest number of votes are elected.

Century Club of New York.

600 members.

The officers are chosen at each Annual Meeting by ballot. There are no provisions in the Constitution and By-Laws for nominations, or for inspectors of election.

Harvard College Plan.

Five Overseers elected each year.

A nominating committee of seven is elected by the electors at a public meeting. This committee makes up a list of twenty eligible persons and sends this to each voter. The voter fills out his ballot with six names, but is not confined to those suggested by the committee.

The ten names having the greatest number of votes are then submitted to the Annual Meeting as candidates. Each voter must erase five names, leaving five voted for.

The nominations are thus made by letter ballot, but the election is by personal ballot.

The New England Society, of Orange, N. J.
102 members.

Board of officers consists of a President, two Vice-Presidents, six Counsellors, a Secretary and Treasurer, elected annually. Elections conducted on the Hare System. At least one month before Annual Meeting, the Secretary must furnish each member with five blank forms for nominations. These ballots to be filled out and returned to Secretary within ten days, and opened as received and counted by a committee, of whom the Secretary shall be one. The committee's report to the Annual Meeting to be final.

E. Yardley's Plan.

Board of Direction to consist of eight. Nominating committee to present twelve names.

Members to erase or substitute. Each member to have eight votes which he may assign all to one man, or divide as he pleases. The eight names having largest number of votes to be elected. The Board then to choose from their own number President and Vice-Presidents.

The Board to elect Secretary and Treasurer not of their number, who shall hold office during good behavior or until election of successor.

Term of office to begin on January 1st following election.

American Society of Civil Engineers.

600 members.

Present By Law.

At the Annual Convention a nominating committee of five members, not officers of the Society, shall be appointed by the Convention. This committee shall present to the Board of Direction, on or before the first day of October, the names of the persons selected by them as candidates for officers. Of these, at least one Vice-President, three Directors, the Secretary and the Treasurer, shall be resident members. The Board of Direction shall thereupon cause such list to be posted in the rooms of the Society and shall issue at least twenty days before the Annual Meeting a letter ballot containing the names thus proposed.

Any five members, not officers of the Society, may present to the Board of Direction, on or before October 1st, a list of names

proposed by them for officers, which list or lists shall also be issued for ballot.

No member of any nominating committee shall be presented by such committee as a candidate for office.

It will be seen that, in these eleven schemes of nomination, there are four distinct methods of selection.

I.—No previous nominations are provided for, but the election is supposed to be left to the discretion of members voting, as in the New York Club, the Century Club, and the New England Society of Orange. In practice, a nominating committee is appointed in the two first named organizations.

II.—The officers of the Society prepare a list of candidates, the number of the same being greater than the number to be elected, as in the Institution of Civil Engineers and the Institution of Civil Engineers of Ireland.

III.—Nominations are sent in by individual members, and a list of such, with additional names proposed by the officers, is sent out for ballot, as in the Society of Engineers (London), the North of England Institute of Mining and Mechanical Engineers, and the American Institute of Mining Engineers.

IV.—A nominating committee is elected by the members at a general meeting, which committee proposes a list of candidates to be voted for, as in the American Society of Civil Engineers, the Harvard College Board of Overseers, and the Union League Club. This feature is also retained in Mr. Yardley's plan.

The first method named was practiced by this Society previous to the annual meeting of 1877. The objection to it was that it placed the selection of officers entirely in the hands of the small proportion of members who attend the annual meeting, and the greater part of these being resident members, the Society at large had little voice in the election. A great deal of unnecessary time was consumed in the election, owing to the scattering nature of the vote. Usually several more ballots were taken than there were officers to be elected.

If efficiency and interest in Society affairs was the sole thing to be looked at in the selection of officers, the second plan would undoubtedly be the most effective, for the actual officers of the Society know best which of the members display an intelligent interest in its affairs. The plan is open, however, to the objection that it might tend to make the board a close corporation, and keep the same set in office all the time.

The third plan is open to serious objections in the case of this Society. Either members

will neglect to send nominations, leaving the board to make up the list, as in the second plan, or else a large number of nominations will be presented, most of them representing the personal preference of a single member. No judicious selection could be made from such a list by the mass of members who are widely scattered and who really know little about the business of the Society or the personal character of its officers.

The fourth plan appears to be the fairest and best, and when submitted to the Annual Convention in 1877 was approved by a unanimous vote. The few objections which have been made are to its mode of application. It has been urged that sufficient liberty of choice is not left to the members, and that, therefore, the plan is not as democratic as it should be. By the Harvard plan, the selection of candidates is certainly made in a more democratic manner, but involving as it does, practically, two ballots on the part of all the members, it is believed to be too cumbersome and unwieldy for the use of this Society. It must be borne in mind also that the officers of this Society are not merely honorary positions, but that the officers are the trustees of the property of the Society and the directors of its policy. By the law under which it is incorporated, a majority of the trustees constitute a quorum for the transaction of business, and they must, therefore, be so situated as to be able to attend the meetings of the board. The experiment of having a number of the trustees residents of remote districts, which was tried during the past year, has not been a success, as three members of the board have not attended a single meeting nor made any inquiries as to the action of their colleagues.

The committee, in deference to the opinion which is widely entertained, that more latitude should be given to the representation of the preferences of the members at large in the formation of the list for candidates, submit to the Society the subjoined by-law, as a substitute for that which was adopted at the Annual Convention in New Orleans in 1877.

Respectfully,

J. J. R. CHOEZ,

Chairman.

November 6, 1878.

BY-LAW.

1. Before the annual convention each year, the Board of Direction shall make a territorial apportionment of the members of the Society (including also Associates and Juniors) into

seven districts, each containing, as nearly as practicable, the same number of members, and shall present the same at the convention. The convention shall select a member from each of said districts to serve on the Nominating Committee. The Chairman of said committee shall be the member representing the district in which the place of business of the Society is situated.

2. Before the first day of August next ensuing, each member of said committee shall send to the Chairman a list of persons proposed by him for officers, giving one name for each officer to be elected. The Chairman shall thereupon send a full list of the names proposed to each member of the committee, who shall return said list to the Chairman, having first erased therefrom all names in excess of double the officers to be elected, except that only one name shall be left for President.

The Chairman shall prepare from the returned lists a balloting list, comprising the one name for President, three names for Vice-Presidents, the two names for Secretary, the two names for Treasurer, and the ten names for Directors which appear on the greatest number of lists.

The balloting list thus prepared shall be presented to the Board of Direction on or before the third Wednesday in September, and shall be sent by them to each member of the Society before the first day of October.

Each member entitled to vote at the annual election may erase any names on said list and substitute others, but no ballot shall contain, when presented to the Society, more than one name for each officer to be elected.

The ballots shall be received by the Secretary in accordance with the rules established by the Board of Direction for letter ballots, and all ballots received before twelve o'clock of the day of the annual meeting shall be placed in the hands of three tellers, appointed by the Presiding Officer, and by them canvassed, and the result certified to in writing and presented to the Chairman, who shall declare it to the Society. The person having the greatest number of votes for each office shall be declared elected. In case of a tie, the choice between the two candidates to be made by ballot of the members present.

No member of the Society who is in arrears for dues for either any previous or the current year, shall be eligible for office or for a position on the Nominating Committee.

ON THE CIRCULATION OF THE BOOKS OF THE LIBRARY.

The following report was presented by the Library Committee to the Board of Direction, adopted by the Board, submitted at the annual meeting, November 5th, 1879, and accepted :

To the Board of Direction of the American Society of Civil Engineers :

At the meeting of the Society held during the Annual Convention in Cleveland, on June 18th, the Library Committee was requested to report whether some plan may not be adopted to enable members living away from New York to consult the books of the library, under proper regulations to insure their return and to prevent injury.

The question here presented is by no means a new one to the members or officers of the Society, having been discussed at considerable length between July 2d, 1873, and 1st November, 1876. On the last named date the Board of Direction, in their Annual Report (Vol. 2. p. 146), said :

"The use of a library of the Society will be restricted to resident members and those non-residents who occasionally visit New York, unless means be taken, under necessary restrictions, to send works to those who desire it, or here to make examinations for them. That by some such plan it is feasible to render a library of this character of great value to members remote from the centres of literary and professional knowledge, is believed, and full consideration of the matter by the Society, with a view to elaborate such a plan, is recommended."

This recommendation was not favorably considered by the annual meeting, and no action was taken upon it..

The reason for this indifference was, doubtless, that at the preceding annual convention, held in Philadelphia in June, 1876, the Committee on the Establishment of an Engineering Library and Museum, which was appointed in 1873, reported (Vol. 2, p. 82) that they had taken no action since the previous convention, and were discharged.

In addition, the Committee on the Policy of the Society, appointed in June, 1875, which made a careful and valuable report at the annual meeting in November, 1875 (Vol. 1, p. 318), had not in their report considered the possibility of such a dissemination of the library; while they had urged that the rooms should be kept open at all times to give members the opportunity to consult professional literature.

The committee above mentioned, on "Establishment of an Engineering Library," while suggesting the possibility of a circulating system, were not agreed as to its advisability. The Chairman, Mr. Leverich, said (Vol. 1, p. 226), "In these times of cheap and rapid expressage, duplicate volumes may be loaned to a non-resident member, and at small risk and cost sent to him, no matter how remote his residence is; while another member, Mr. C. Hermans, held that "this plan would not do, for the reason that nine out of every ten books sent out would never find their way back to the library" (p. 228).

Although the question of circulation of the library would thus seem to have been adversely decided, after much discussion, the Library Committee have felt it their duty to carefully consider it again in compliance with the desire of those of the older members who have forgotten the previous discussions, and the new members who are unacquainted with them, and earnestly hoping that some means might be devised to make the store of professional information in the library of the greatest possible value to all the members of the Society.

The conclusion the committee have reached is that it is impracticable and inexpedient to allow volumes to be taken from the library. In support of this conclusion, they present the following considerations :

The functions and uses of a library for professional reference and study are as different from those of a library of general literature as are the contents of one from those of the other.

The library of the Society contains few books which can be read continuously within a limited time, with profit. The student of a particular subject for practical use in his profession requires generally not one book alone for perusal; and then, after the lapse of several days, another, to be in turn replaced by another, but he must have access to a quantity of works on the subject at one time, so that while the matter is fresh in his mind he may collate and compare a chapter, perhaps, of one, a sentence in another, a plate in a third, and a mere reference in others. Twenty or thirty books and papers may have to be consulted, and it is not infrequent to find among that number only one or two which give the exact information desired.

Mere titles and headings go for little in such a research. The particular treatment of

In case of a tie, election to be decided by lot.

North of England Institute of Mining and Mechanical Engineers.

4 classes of members—Original, 750; ordinary, 17; associate, 12; honorary, 24; total, 803 members: students, 151.

Officers other than Secretary and Treasurer are elected from the original, ordinary and associate members, and consist of a President, six Vice-Presidents and eighteen Councillors, who with the Treasurer and Secretary constitute the council.

The President, Vice-Presidents and Councillors are elected at the Annual Meeting in August, and are eligible for re-election, with the exception of any President or Vice-President who shall have held office for three immediately preceding years, and such six councillors as may have attended the fewest council meetings during the past year.

The Treasurer and the Secretary are appointed by the Council and are removable by the Council subject to appeal to a general meeting.

Each member is at liberty to nominate in writing, and send to the Secretary not less than eight days prior to the ordinary general meeting in June, a list duly signed of members suitable to fill the offices—for the ensuing year.

The Council prepares a list of the persons so nominated, together with the names of the officers for the current year eligible for re-election, and of such other members as they may deem suitable. Such list must comprise at least 30 names. The list so prepared is submitted to the June meeting, and is the balloting list for August.

A copy of this list is posted to each member who may erase and substitute names, but names left must not exceed number to be elected.

The Chairman of the Annual Meeting appoints 4 scrutineers who receive the balloting papers, and after scrutiny destroy the same, and sign and hand to the Chairman a list of the elected officers.

Balloting papers may be sent by mail to Secretary or Chairman.

All Past Presidents are *ex-officio* members of Council, and Vice-Presidents who retire shall be *ex-officio* members for the following year.

Institution of Civil Engineers of Ireland.

148 members.

Officers: President, two Vice-Presidents, Honorary Secretary, and eight other members, who constitute the Council.

The President is not eligible for more than two years, and on vacating becomes an *ex-officio* member of Council. One Vice-President and two members of Council retire each year, but are re-eligible after one year.

Two members of Council are elected from the Associates. At the ordinary general meeting in December, the Council present a list of persons whom they nominate. Members may erase and substitute, leaving, however, twelve names. Lists containing more or less than twelve names to be rejected.

The meeting chooses two Scrutineers.

American Institute of Mining Engineers.

784 members.

Nominations may be sent in writing to the Secretary, accompanied with the names of the proposers, at any time not less than thirty days before the Annual Meeting. Two weeks before said meeting, the Secretary mails to every member the list of all nominations received. Voters may substitute, but the number of names voted shall not exceed number of officers to be elected.

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Persons who have received the greatest number of votes are elected.

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Annual Meeting held in January. Polls for election opened at 6:30 P. M., and open three hours.

At monthly meeting in December, a committee of seven, appointed by the Club at large, who shall report list of candidates.

Four inspectors and canvassers of election appointed by Club.

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At Annual Meeting the Club ballots for officers. The presiding officer appoints three inspectors.

Candidates receiving the highest number of votes are elected.

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Mere titles and headings go for little in such a research. The particular treatment of

a subject, or the note sought cannot be surmised even from the name of the book.

One great practical objection to making a library of reference circulating is based on this fact. The matter treating of any subject of importance is scattered through so many books and technical journals, that in most cases a large number of volumes would have to be sent to the seeker for information, and possibly the greater portion of them would prove not to contain exactly what he needed. But he would be at the expense of their transportation, all the other members of the Society would be deprived of their use while they were absent, and the library would be at the risk of losing them, and consequently of the destruction of the value of the sets to which volumes belong.

The absence from the library of even a few volumes for several days, or more probably weeks, would be of more injury to the library itself and to the society by creating dissatisfaction than the inability of distant members to use the books.

It is probable that more real use of the library for study is made by non-resident members now than by residents. Members from a distance when visiting New York take advantage of that opportunity to look up the literature of the subject in which they are interested. If such a visitor found that the works he desired to consult were scattered to all parts of the country, to be absent for several weeks, he would unquestionably conclude that the library of the Society was a delusion, and the pretended facilities it offered a humbug.

The risk of losing the volumes sent out, is too great to be taken. The books most likely to be needed are not only valuable in themselves, but they have the additional value that rarity confers, and which is hardly to be estimated in money. No librarian or officer of the Society would feel warranted, even by the most liberal grant of authority by a Society vote, in either fixing a price to be deposited in advance for the loan of, for instance, one of the ten volumes of the papers of the Royal Engineers, or in sending without security one of them to Chicago or New Orleans.

The value of a book to its possessor is not to be estimated by any one else, and even with such a provision for exorbitant deposits as security, as to be prohibitory to the majority of the members, the loss or mutilation of valuable books would be certain. The testimony of librarians on this point is very strong, and offers a great mass of facts which are aston-

ishing to those not familiar with the effects of bibliomania on otherwise respectable and honorable men.

The members entitled to the use of the library number now more than six hundred, and they are distributed over the whole area of the United States and Canada. The difficulties of enforcing any penalties for violation of rules or breach of confidence would be so great as to be practically insurmountable.

The conditions under which many of the books in the Library have been presented, make it impossible to allow them to be sent out. After deducting such books from the list, and also those which are rare and difficult to replace, and those which are in the character of encyclopædias and unfit for circulation, the number left for circulation would not be great, and their character would be such that they would not be likely to be in demand.

While the project of making the library a circulating one seems unadvisable, it is unquestionable that much may be done in the way of making it useful to all the members.

To this end, the first requisite is that members should know what may be found in the Library, and for this purpose a printed catalogue is essential, to be classified according to subjects. The card system of cataloguing is undoubtedly exceedingly useful and convenient for Library use, but to non-resident members it is valueless. For various reasons, mostly financial, no catalogue has yet been made, but the time has arrived when it is a necessity, and it should be the first duty of the Board of Direction to have it done. It is the only means by which members can be informed of the condition of the Library and of its needs. It is desirable that we should have a very full collection of American reports, and there are doubtless many in the possession of members who would send them to fill vacancies in our lists.

With a catalogue in its possession, supplemented by the monthly publication in the "Proceedings" of additions to the Library, a member could decide what he wanted to look at in advance of a visit, and thus save much of his own time and that of the Librarian.

The periodical literature of the day is so voluminous and so rich in valuable matter, that the Engineer cannot keep up with current advances in science without great cost and labor. It would be of immense advantage to members of the Society to have a topical index to the journals received by the Society published monthly in the Proceedings. The preparation of such an index would occupy the

whole time of one man, and he should be one familiar with several languages.

It would be out of the power of the Secretary to attend to this duty in addition to the business, the correspondence, the editorial work, and the necessary attention to members and others visiting the rooms of the Society.

With the aid of such an index, distant members could generally procure copies of the special articles they desired to see, at less expense than would be involved in correspondence and transportation of volumes from the Library.

It is a question to be carefully considered whether the expense of this work can be undertaken in the present state of the Society's affairs.

The matter of furnishing to members searches of authorities and abstracts or briefs on special subjects is worthy of consideration. Letters are sometimes received from distant members asking for such full and detailed information of this kind as could

only be furnished after several days of careful examination by an expert in the branch inquired about, and instances have occurred of much dissatisfaction being expressed, because all the information could not be given without expense. It may fairly be questioned whether this class of special research for individuals should be done at the expense of the Society. At the same time those who need the information are frequently not able or willing to bear the cost alone. For such cases there does not seem to be any relief except by the establishment of a fund the interest of which should be devoted to the purpose. The means of such establishment do not now appear. It is not advisable that the Society should go begging for money and thus lower its character and standing. The day may, and probably will, come, when the money will be offered.

The Committee invite a full and frank discussion of these points and ask for practical suggestions from members of the Society,

MEMOIRS OF DECEASED MEMBERS.

SAMUEL J. REEVES,* Member A. S. C. E.

DIED DECEMBER 15TH, 1878.

By the death of Mr. Reeves. American engineering has lost one who has contributed in no small degree to the extraordinary development of constructive iron work in America which the last twenty years have witnessed. While men markedly inferior in attainments, personal characteristics and influence have been noticed far and wide in the public prints, it is somewhat astonishing that the career of a man who has done so much practical good for his country as Mr. Reeves should pass away without exciting even a ripple of public comment, further than in the immediate professional and business circles with which he was in contact. The history of Mr. Reeves' life would be largely a history of iron making in America, an industry in which he was always in the van, impelled as much by the ambition created by a liberal education as by the purely vulgar considerations of trade.

Mr. Reeves was the son of David Reeves, and was born at Bridgeton, N. J., in 1818; was educated at Lawrenceville (N. J.) Academy, where he was prepared for Princeton College, from which institution he was graduated in 1837. To this educational preparation for his future career, Mr. Reeves added the experiences of travel, both in this country and in

*Committee to prepare memoir, John Griffen, Alfred P. Boller.

Europe. In 1846 he married a Baltimore lady, Miss Handy, who still survives him, together with five of the six children which were born to them.

Mr. Reeves commenced his business life about 1841 under his father and uncle, proprietors of the Cumberland Nail and Iron Works, at Bridgeton, N. J. The father and uncle were at the time, and had been for a long period also interested in a nail mill at Norristown and also in the Phoenix Iron Works, at Phoenixville, Pa., which latter was established in 1790 by Benjamin Longstreth. In 1827 the Phoenix Iron Works passed into the hands of Reeves, Whitaker & Co., afterwards (1846) Reeves, Buck & Co., which firm, in the same year, also became owners of the Bridgeton Works, with which the family connection, however, ceased in 1870. In 1855 the firm of Reeves, Buck & Co. became the Phoenix Iron Company, the title still retained. At Phoenixville the iron operations of the Reeves family were on a much larger scale than those conducted at Bridgeton or Norristown, where it was confined chiefly to the manufacture of nails. At Phoenixville the manufacture of railroad iron, pig iron and merchant bars was added to their nail production.

In 1846—November 16—the first rails were rolled at these works, since which time there has been a progressive increase in the iron shapes rolled at this establishment, until their "list" of shapes has become the most comprehensive of any rolling mill in America. In 1848 Reeves, Abbott & Co. erected a rolling mill and blast furnace at Safe Harbor, Penn., to roll rails for the Pennsylvania Railroad Company, of which enterprise Mr. Reeves was the virtual head. Mr. Reeves for many years and up to his death was a Director in the Board of the Cambria Iron Company, as his father before him had been. As President of the American Iron and Steel Association, a position filled by Mr. Reeves for ten years preceding his death, he had the unqualified support and confidence of its members.

From this brief summary, it will readily be seen that Mr. Reeves was necessarily an employer of labor on a vast scale, which, to successfully control and direct, required a talent for organization and system possessed by but few men. At the time of his death the great Phoenix Iron Works employed over 2,000 men in all its departments.

As might be expected in a Pennsylvanian and an iron master, Mr. Reeves was a strong Protectionist of the Carey school, and he was ever ready to defend the principles of that school of political economy with an earnestness bred of conviction and a thoroughness due to thoughtful study. Mr. Reeves by nature was extremely conservative, and had he been simply the self made man, self taught, with only the experience of his local surroundings, would have been a successful follower in the improvements continually introduced into the manufacture of iron, instead of being in the van. He would have made rails, and good ones, too, all his life, and been successful as a business man. Fortunately,

the advantages of a liberal education and the opportunities of travel tempered his natural disposition and broadened his views, so that, as always comes to a naturally strong man, with a trained intellect, he was ambitious to accomplish something more than the mere success of making money.

Seconded by the able assistants he called around him, he, as rapidly as he was able and so soon as he saw an opening for new ideas, introduced the manufacture of specialties at Phoenixville, and in every sense was the pioneer of constructive wrought iron work in America. The double lipped wrought iron railroad chair was first made at Phoenixville by rolling, enormous quantities of which were used on our railroads until the pear head section of rail gave way to the now universally adopted girder section with a straight stem.

While it is true the Trenton Works made the first rolled beam in this country (9 inch in 1853), the Phoenix Works were practically the first to manufacture for the market beams of varying sizes and sections, for many years being without a competitor—until 1864 they were the only manufacturers of large beams and channels in America. One of the boldest strides forward was the manufacture of hydraulic die forged eye bars, undertaken with a view to supplying such bars for the channel span of the Steubenville bridge about being constructed by Mr. Linville in 1863.—the first of the great spans with which we have since become so familiar.

Foreseeing with an almost prophetic eye the great demand that would spring up for constructive iron work, Mr. Reeves made all his improvements tend towards the manufacture of "shapes," and the designing and construction of all descriptions of wrought iron framing. In 1862 the wrought iron column known as the "Phoenix Column" was patented by Mr. Reeves, and for a long time it was considered almost impossible to build a long span bridge without its use. This patent was contested on the ground of infringement by Linville & Piper, in 1867, but was sustained by the judge on its priority and principles. Previous to the panic of '73 Mr. Reeves commenced the "new mill" at Phoenixville, on a scale second to none in America, being 930 feet long and 430 feet wide. At the time of the panic it was almost completed, and still awaits the revival in the iron trade that will warrant the additional product that such a mill is capable of turning out. It was intended that this mill should be perfect in every proved modern appliance for manufacturing iron and steel, and no labor or money was spared to carry out this view.

It will be seen from the above rapid summary of the development of the Phoenix Works, of which Mr. Reeves was practically the sole head, that American engineering owes much to him, and the Transactions of the American Society of Civil Engineers form a fitting tablet to place this debt on record. But far above all is the legacy of character Mr. Reeves has left his family and friends, and the example of a wonder-

fully successful business career, untainted by trickery or any dishonorable dealing.

Mr. Reeves was not perfect; he had his peculiarities of character and imperfections of humanity like others; he had his enemies, like every other strong man; but his heart was warm, his aspirations high, and an irreproachable integrity was his through life. He was a gentleman in the highest and best sense of the term, generous and sympathetic, and whose death is a real bereavement to those with whom he was associated.

FRANKLIN ASA STRATTON,* Member A. S. C. E.

DIED JULY 17TH, 1879.

Franklin Asa Stratton was born in Northfield, Mass., November 30, 1829. His parents were Asa and Sophia Stratton, the latter still living.

Early manifesting a fondness for books and study, he was allowed to gratify his own childish wish of attending school at the age of three and a half years. After finishing the common school course he entered the academy of his native town. He exhibited an aptitude and decided taste for mathematics, taking up and completing, unassisted, the study of algebra, that branch not being included in the school course.

He was remarkable, even in those early years, as a patient and indefatigable student, not only of text books, but those embracing a wide and varied range of knowledge, and for his perfect self-reliance. These qualities gave him high rank in the boys' school at Brattleboro, Vt., which he entered, after completing his academic course, and which was under the charge of the Rev. Addison Browne, who taught the classics and higher mathematics, including civil engineering. He here excelled in mathematics, and mastered the difficulties of problems which had puzzled many teachers.

On leaving the school at Brattleboro, Vt., he formed a party of engineers at Rochester, N. Y., and as a mark of confidence in his ability he was entrusted with the construction of a short road to Lake Ontario, which he completed to entire satisfaction. As a well-deserved tribute to the perfect confidence placed in his judgment and discretion, it should be recorded that the work here included not only the engineering and building of the road, but the disbursing of the moneys invested in the enterprise, and this at the early age of twenty years.

From here he went to the Toledo & Wabash Railroad, and was located at Lafayette, Ind., until the completion of the road. Leaving Lafayette he went to Fort Dodge, Iowa, where he opened a land office, transacting the business connected with that position.

At the time of the massacre at Spirit Lake in 1857, he commanded a company of riflemen in a severe mid-winter campaign against the Sioux

* Committee to prepare memoir, F. C. Prindle.

Indians. At the outbreak of the Rebellion he was engaged in the study of law, but heeding his country's call and need, he formed a company, went to Washington and entered the military service as captain of Company A, Eleventh Pennsylvania Cavalry, and was regularly promoted, to the grade of major in September, 1862, Lieut.-Colonel, September, 1864, Colonel, May, 1865, and Brevet Brigadier General in September, 1866.

Of Gen. Stratton's military service, "Bates' Martial Deeds of Pennsylvania" makes honorable mention in a biographical notice.

We find that he was engaged in nearly thirty pitched battles, beside many skirmishes and minor affairs. He was twice wounded, viz., on the 17th of March, 1863, in a sabre charge at Franklin, in which he displayed great courage and skill; and again in a hand to hand encounter in the battle of October 7th, 1864, where he received a sabre cut in the hand.

He particularly distinguished himself in the raid led by Wilson and Kautz, five hundred miles inside of the enemy's lines, in which three battles were fought and thirty miles of the Danville Railroad were destroyed, he having the lead in withdrawing in face of vastly superior numbers sent to intercept them.

In the last campaign against Lee, his command had the honor of opening the final battle of the war in Virginia, it having occupied with Gen. Miles' division of infantry the famous Lynchburg turnpike, leading out of Appomattox.

In addition to constant service in the saddle, he performed a great deal of military engineering for the government, making military maps of the country before Petersburg, for Gen. Mansfield, which were of great service during the latter part of the war.

Gen. Stratton was married February 24, 1866, to Mrs. Georgie E. Griffith, *née* Keeling, of Norfolk, Va., who still survives him, and on the 28th March, 1867, was commissioned a Civil Engineer in the naval service, and ordered to duty as Civil Engineer of the Washington Navy Yard, a position formerly filled by Gens. Rosecrans, Benham and others of the United States Engineer Corps. July 9, 1875, he was ordered to League Island in charge of the construction of the important public works projected for a navy yard at that point, and where he was stationed at the time of his death.

In addition to these arduous duties, he served as a member of the Boards of Civil Engineers appointed by the Navy Department to examine the sites of the League Island, Mare Island, and New London Navy Yards, and prepare plans for their development and permanent improvement upon a large scale, and was also entrusted with other important professional duties by the government, all of which were performed with zeal and efficiency.

While engaged at League Island a severe storm visited that vicinity, in October, 1878, which culminated in a disastrous flood, causing an

overflow of the dykes and blowing down the shiphouse, etc. During this crisis Gen. Stratton remained at his post of duty almost constantly for several successive days and nights, personally directing repairs and trying to avert further disaster, and animating his men in the hurried and imperative work of saving government property, utterly regardless of personal discomfort and exposure, being often knee deep in mud and water and thoroughly drenched. A severe and deep seated cold was contracted as a result of this exposure, which culminated in an attack of typhoid pneumonia, from which he died, at Chestnut Hill, near Philadelphia, on Thursday evening, July 17th, 1879, in the fiftieth year of his age,

Gen. Stratton was remarkably modest and retiring in his character, which also possessed that most rare, difficult and victorious element, a patient spirit—one that could learn to labor and to wait and abide its time. Professionally he possessed superior abilities as a civil and mechanical engineer, and in his death the government has lost a faithful and efficient officer; the profession, a valued member, whose attainments and experience, combined with his personal worth and estimable character, furnish an example worthy of all notice; and his personal acquaintances, a warm and generous friend.

His whole life was full of work—hard work, both mentally and physically, and it deserves to be written as a golden honor to his memory, that during all these busy years of varied and arduous service, away from his home, his love and continual remembrance of his aged mother was a noticeable feature of his excellent character.

Reviewing the character of Gen. Stratton, we find it strikingly illustrative of the trite but truthful adage, "the boy is father of the man;" from the early schooldays, until the close of his laborious and eventful life, we see the same masterful spirit modestly asserting itself, persistently surmounting difficulties and bravely ignoring self in the discharge of his duties, until the loyal soldier, the faithful servant, the true friend, and the loving husband, father, and son falls at his post—with the harness on—to be sincerely mourned by all who knew him.

JAMES E. BELL,* Member A. S. C. E.

DIED JUNE 9TH, 1879.

James E. Bell was born in Cincinnati, Ohio, on the 28th of December, 1849. His grandfather was a captain in the British army, who came to America in 1812, just before the declaration of war. He first settled in Lancaster, Pennsylvania; but in 1817 he removed to Cincinnati, and, with the exception of a few years' residence at Rising Sun, Indiana, he continued to be a citizen of Cincinnati until his death.

* Committee to prepare memoir, Col. Wm. E. Merrill.

Mr. Bell's father, Joseph Bell, Esq., has long resided in Cincinnati, where he is in charge of an extensive foundry and machine shop.

James E. Bell received his early education in the common schools of Cincinnati, and finished his course at the Woodward High School in June, 1869. In September of that year he entered the Rensselaer Polytechnic School at Troy, N. Y., whence he was graduated in June, 1873. He was thus careful to prepare himself by special study in the best schools, and did not assume the title of "engineer" until his diploma gave him the right to use it. The success which at the time of his early death had already attended his efforts in his chosen profession was largely due to his excellent training, by means of which he was soon able to erect a stable edifice of practice on a broad foundation of the fundamental principles of mechanics and engineering.

Ambitious to excel, and desirous of speedily acquiring experience in practical construction, he sought and obtained service, during his vacations, as an assistant to Jno. C. Wilson, C. E., engineer in charge of the erection of the Newport and Cincinnati Railroad Bridge over the Ohio river.

After leaving Troy Mr. Bell was employed about three months on surveys connected with the location of the Cincinnati Southern Railway, under the direction of the Chief Engineer, Mr. Wm. A. Gunn (Member Am. Soc. C. E.). For nearly a year longer he had charge of a party engaged between Dayton and Springfield, Ohio, in re-surveying a route for the C. C. C. and I. R. R. (Dayton Short Line or Bee Line).

In July, 1874, he took service under Col. W. E. Merrill, U. S. Engineers (Member Am. Soc. C. E.), and made a survey of the Big Sandy river from its mouth to Warfield, Ky., on the Tug Fork, and to Piketon, Ky., on the Louisa Fork. In 1875, in obedience to an Act of Congress, this survey was extended up the Louisa Fork to the mouth of Dismal Creek, in Virginia. This second survey was also made by Mr. Bell.

In November, 1875, he was assigned to duty at Hoard's Rocks, W. Va., on the Monongahela, below Morgantown, with orders to continue the work of building a masonry lock and dam at that point. He remained on this duty until November, 1876, when all work was stopped, owing to the exhaustion of the appropriation.

In June, 1877, Mr. Bell was put in charge of the improvement of the Little Kanawha river, and he remained on this duty until work was stopped by cold weather. This was his last service under the government. His reports on the Big Sandy, and his reports of operations on the Monongahela and on the Little Kanawha, will be found in full in the Annual Reports of the Chief of Engineers.

On the 10th of July, 1878, he received from the Board of Public Works of the City of Cincinnati the appointment of Superintendent of the City Water Works. He filled this important and responsible position with great acceptance until his death on the 9th of June, 1879, at the

early age of twenty-nine. He succumbed to an attack of inflammation of the bowels. He left a widow, but no children; having been married but little more than a year.

He was elected a member of the American Society of Civil Engineers on the 5th of March of the present year, and thus was numbered amongst us for the very brief period of three months.

Of a genial disposition, his business relations were always pleasant; but his kindness of heart never caused a relaxation of official vigilance. Sternly honest himself, and animated by a keen sense of duty, shirking contractors found no weak spots that would excuse them from a complete and exact performance of their engagements. Full of zeal for his profession, with the best available training and an increasing experience, and already the incumbent of one of the highest professional positions in his native City, life seemed to present for his acceptance the highest honors of his chosen career. But the destroyer seized the strong man in the vigor of his youth, and in a few short days his honors had faded, his place had been filled by another and his memory alone was left to the friends that loved him and had rejoiced in his early success.

ADDITIONS TO LIBRARY AND MUSEUM.

DONATIONS TO THE LIBRARY.—Members and others are asked to contribute regularly to the library of the Society, copies of government, municipal, railway, canal and other reports, specifications, profiles, maps, photographs and like matter, making up the record of engineering operations for the past or present, and to inform the Secretary where such may be had. Duplicate copies are desired, for transmission to foreign societies in return for works collected and sent to this library by them; also for exchange with members and others who wish complete sets referring to particular subjects. Donations of old or new reports or pamphlets which refer to or illustrate Engineering constructions or operations are particularly solicited. Many of these may be really of great importance as a part of the Library, and as possibly containing information which might not otherwise be preserved.

"Copies for distribution" named in this list will be sent to members forwarding stamps to prepay postage until the supply is exhausted.

From Administration des Ponts et
Chaussées, Paris:
Annales, September, 1879.

From Aeronautical Society of Great
Britain, Fred. W. Brearey, Hon. Sec-
retary, London:

Thirteenth Annual Report of the Society.
1878.

From American Chemical Society, P.
Cassamajor, Secretary, New York:
Journal of the Society. Vol. I., Nos. 8 and 9.

From American Institute of Mining En-
gineers, Dr. Thomas M. Drown, Sec-
retary, Easton, Pa.:

Proceedings of the Meeting held at Montreal,
September, 1879.

A direct Process of Copper Smeltng. H. M.
Howe.

Experiments with Charcoal, Coke, and Anthra-
cite in the Pine Grove Furnace, Pa. John
Birkinbine.

Recent Improvements in Concentration and
Amalgamation. John A. Church.

An Autographic Transmitting Dynamometer.
Wm. Kent.

The Hygiene of Mines. R. W. Raymond.
Washing Phosphoric Pig Iron for the Open
Hearth and Puddling Processes at Krupp's
Works, Essen. A. L. Holley, L.L.D.

Relations of Sulphur in Coal and Coke. Dr.
J. F. Kimball.

Notes on the Zinc Deposits of Southern Mis-
souri. A. W. Raymond.

From Argentine Scientific Society, Don
Eduardo Aguirre, Secretary. Buenos
Ayres:

Annals of the Society. September, 1879.

From Boston Public Library, Mellen Chamberlain, Librarian, Boston: Bulletin of the Library. October, 1879.

From E. S. Chesbrough, Chicago: Third Annual Report of the Department of Public Works of the City of Chicago.

From Francis Collingwood, New York: Photograph view of Trestle for the erection of Second Block of the New York Approach of the East River Bridge, together with the Arch over Cliff street.
Photograph view of New York Anchorage and first two Arches of the Approach of East River Bridge.

From Commissioners of Second Geological Survey of Pennsylvania, Wm. A. Ingham, Secretary, Philadelphia: Part First. The Northern Townships of Butler Co.

Part Second. A special Survey made in 1875 along the Beaver and Chenango Rivers in Beaver, Lawrence and Mercer Counties. H. Martyn Chance.

Second Report of Progress in the Laboratory of the Survey at Harrisburg. Andrew S. McCreath.

From Charles E. Emery, New York: United States Centennial Commission. Reports and Awards Group XX. Motors, Hydraulics and Pneumatic Apparatus, &c. Francis A. Walker.

From John Ericsson, New York: Contributions to the Centennial Exhibition. Capt. John Ericsson.

From Albert Fink, New York: Proceedings of Meetings and Conventions of Officers of Eastern and Western Railroads held in June and December, 1878; January, April, May, June and September, 1879.

From Julius E. Hilgard, Assistant in Charge, United States Coast Survey, Washington, D. C.:

Methods and Results; Secular Change of Magnetic Declination in the United States and at some foreign stations. 3d edition. (Copies for distribution.)

From John W. Hill, Cincinnati: Report of the Board of Experts on the Test Trial of the Warden Compound Pumping Engine at the Hunt Street Station to the Board of City Commissioners of Cincinnati, Ohio, 1879. (Copies for distribution.)

From Hungarian Society of Engineers and Architects, Budapest: Transactions, January to July inclusive, and October, 1879.

From Institution of Civil Engineers, James Forrest, Secretary, London: Excerpt from Minutes of Proceedings. Edited by James Forrest. Note on a Graphic mode of ascertaining the Flow of a Mill Stream. Wm. Shelford.

From Institution of Engineers and Shipbuilders, W. J. Millar, Secretary, Glasgow, Scotland:

Transactions of the Institute. Vol. XXII.

From E. D. Leavitt, Jr., Cambridgeport, Mass.: City of Boston; Improved Sewerage; Pumping Engines.

From Hon. F. W. Lincoln, Boston: The History of the Bunker Hill Monumental Association during the first century of the United States of America. George Washington Warren. Boston, 1877.

Proceedings of the Bunker Hill Monumental Association at the Fifty-sixth Annual Meeting, June 17th, 1879. With Address of Frederick W. Lincoln.

From Thomas J. Long, New York: Annual Report Department of Docks of New York, made of the year ending April 30th, 1877.

From E. P. Lull, Commander U. S. N., Washington, D. C.: Reports of Explorations and Surveys for the location of Inter-oceanic Ship Canals through the Isthmus of Panama and by the Valley of the River Napipi, by U. S. Naval Expeditions, 1875. Commander E. P. Lull, U. S. N., and Lieut. Frederick Collins, U. S. N. Washington, 1870.

From New York Meteorological Observatory, Department Public Parks, Daniel Draper, Director, Central Park, New York:

Abstracts of Registers from Self-recording Instruments, September and October, 1879.

From North of England Institute Mining and Mechanical Engineers, Theo. Wood Bunning, Secretary, Newcastle-on-Tyne, England:

Transactions, February, March, April, May, June, August, 1876; May and June, 1878; August, 1879.

From Mechanics' Institute, S. H. Wheeler, Cor. Secretary, San Francisco, Cal.:

Reports of the Eleventh, Twelfth and Thirteenth Industrial Exhibition under the auspices of the Mechanics Institute of San Francisco.

From Midland Institute of Mining, Civil and Mechanical Engineers, Joseph Mitchell, Secretary, Barnsley, England:

Transactions, Vol. VII. Part XLVII. August and September, 1879.

From Charles Paine, Gen. Sup't. L. S. and M. S. R. R., Cleveland, Ohio: Memorandum of Tests showing relative cost of burning oil (with Campbell's Patent Oil Burner) and coal; for Fuel in Stationary Engines at Cleveland Engine shops, Sept. 24th and 25th, 1879.

From H. V. and H. W. Poor, New York: Manual of the Railroads of the United States for 1878-79.

From the Publishers Revue Générale des Chemins de fer, Edgar Monjean, Secretary, Paris:

Revue Générale des Chemins de fer. July and August, 1879.

From the Royal United Service Institution, Capt. B. Burgess, Secretary, London:

Vol. XXIII. No. 101. Double Number. Journal of the Institution.

From the Saxonian Society of Engineers and Architects, Dr. Kahl, Secretary, Dresden:

Transactions. Part 1, 1858, containing description of Viaduct between Waldheim and Limmritz. Part 1, 1879.

Photograph and detail Drawings of Viaduct in Zechopauthale between Waldheim and Limmritz.

From Société des Ingenieurs Civils, M. Mallet, Secretary, Paris: Memoires de la Société. July and August, 1879.

- From Society of Gas Lighting, George W. Dresser, Secretary. New York: The Waste of Energy in the production of Water Gas. Eugene Vanderpool. (2 copies.)
- From D. Torrey, New York: A sample of Iron clad Steel Wire.
- From J. Nelson Tubbs, Rochester, N. Y.: Annual report of Executive Board in charge of Water Works, Fire and Highway Departments and Street Improvements of the City of Rochester for 1878.
- From United States Centennial Commission, Philadelphia, Pa.: Report of the Director-General of the Centennial Exhibition, Philadelphia, 1876, including Reports of Bureaus of Administration. Vols. I and II.
- Reports of the President, Secretary and Executive Committee, together with the Journal of the final session of the U. S. Centennial Commission. Philadelphia, 1876.
- Appendix to the reports of the U. S. Centennial Commission and Centennial Board of Finance.
- Grounds and Buildings of the Centennial Exhibition. Edited by Dorsey Gardner.
- Six volumes, containing Reports and Awards of Groups 1 to 36, and Group on National, State and other Collective Exhibits.
- From United States Light House Board, Washington, D. C.: List of Towers, Beacons, Buoyas, Stakes, Spin-dies and other Day Marks in the Third Light House District. 2 copies.
- List of Beacons, Buoyas, Stakes and other Day Marks in the Fifth Light House District. Corrected to October 1, 1879. 2 copies.
- List of Towers, Beacons, Buoyas, Stakes and other Day Marks in the Sixth Light House District. Corrected to November 1, 1879. 2 copies.
- From Samuel Webber, Manchester, N. H.: Manual of Power for Machinery, Shafts and Belts, with the History of Cotton Manufacture of the United States. Samuel Webber. New York. 1879.
- From other sources:
- The Library Journal, Vol. IV, Nos. 4, 5, 7, 8, 9 and 10.
- Annual Report of the State Engineer and Surveyor on the Canals of the State of New York for 1878. H. Seymour, Jr.
- Special Report on the Coal fields of Little Sequatchee, with a general description of the Cumberland Table Land. J. B. Killebrew, Nashville, Tenn. 1876.
- Exploration of the Colorado River of the West and its tributaries. Explored in 1869 1870, 1871 and 1872.
- Key to the Geology of the Globe. Richard Owen, Nashville, Tenn. 1867.
- Report on the Geology of the eastern portion of the Uinta Mountains. J. W. Powell.
- Mineral and Agricultural Resources of the northern portion of Tennessee, along the Cincinnati Southern and Knoxville & Ohio Railroads. J. B. Killebrew. Nashville, Tenn. 1876.
- The Mineral Wealth, Climate and Rainfall and Natural Resources of the Black Hills of Dakota. W. P. Jenney, Washington 1876.
- Report on the Ocoee and Hiwassee Mineral District. J. B. Killebrew, Nashville, Tenn. 1876.
- The Delta of the Mississippi. C. G. Forshey, Cambridge, Mass. 1873.
- History of the Discovery and Settlement of the Valley of the Mississippi. Vols. I and II. John W. Monette, New York. 1846.
- Annual Report upon the Improvement of the Mississippi River. Appendices to Annual Report of Chief of Engineers for 1875, 1876 and 1877. Maj. C. W. Howell.
- Annual Report upon the Improvement of the South Pass of the Mississippi River, June 30, 1878. Capt. M. R. Brown.
- Ninth Report upon the Improvement of the South Pass of the Mississippi River. April 15, 1878. Capt. M. R. Brown.
- The Physics of the Gulf of Mexico and of its chief affluent, the Mississippi River. C. G. Forshey. Salem, Mass. 1878.
- Lists of Elevations, principally in that portion of the United States west of the Mississippi River. Henry Gannett. Washington. 1877.
- Commercial Freedom for the Mississippi Valley. Capt. John Cowdon. Memphis, Tenn. 1877.
- The World's Navigation. The Problem of River Mouths. W. T. Stackpole. Bloomington, Ill. 1879.
- Fresh-Water Shell Mounds of the St. John's River, Florida. Jeffries Wyman. Salem, Mass. 1875.
- Tobacco; Its Culture in Tennessee, with statistics of its commercial importance, etc. J. B. Killebrew. Nashville, Tenn. 1876.
- Bulletin of the United States Entomological Commission. No. 2. F. V. Hayden. 1877.
- Bulletin of the United States Geological and Geographical Survey of the Territories. Vol. II., No. 4. Vol. III., Nos. 1 and 2. F. V. Hayden. 1877.
- The Winds of the Globe; or, The Laws of Atmospheric Circulation over the surface of the Earth. James H. Coffin. Washington. 1875.

ANNOUNCEMENTS.

The meetings of the Society during December will be on the 3d and 17th. The paper by A. G. Menocal, on Inter-oceanic Canal Projects, published in the present number of the Transactions (November, 1879) will be discussed at both meetings.

On the evening of the Annual Meeting, on the 5th of this month, a reception and supper took the place of the formal dinner heretofore given on similar occasions. Those present enjoyed a very pleasant evening, and it is understood, approved the change.

MEMBERS OF THE SOCIETY are requested to contribute papers on Engineering subjects, giving results of practice, or discussing pertinent theoretical questions; their comments upon papers published in Transactions are solicited, and they are urged to contribute from note-books and other records whatever may bear upon the subjects considered, or upon other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 60, Vol. V.

ILLUSTRATIONS OF PAPERS presented for publication should be distinctly drawn, in broad, sharp lines, upon white, smooth (not "egg" or enameled) paper, with perfectly (not glossy, or gray) black ink, to a scale twice or thrice greater than the print is to be, which in no case should require folding in more than one direction (i. e., the depth of plate, as inserted in Transactions, should not exceed 7 inches). Shades are to be produced by variations in size and spacing of black lines; no brush work or colors are admissible. Unless figures and letters can be well put in, simply pencil them, leaving the engraver to insert them on the plate. Always put a lineal scale upon each drawing.

IN TRANSMITTING LETTER BALLOTS members of the Society are requested to conform in all respects with the printed regulations issued with the ballots. These regulations are frequently not complied with. Ballots are received without the signature of the member on the outer envelope, with initials instead of full signature, or with other irregularities. When laid before the Society such irregular ballots are thrown out, and members sending

them lose their votes. The regulations seem to be as simple as possible to secure a fair secret ballot.

Members who desire to secure complete sets of the Transactions of the Society are requested to send to the Secretary a list of the papers which are needed to fill their sets. Some of the earlier papers are out of print. If orders are received for a sufficient number to warrant the expense, a reprint will be made.

The following resolution was adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door east from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A. M. to five o'clock P. M. each business day, except Saturday, when it is closed at three o'clock P. M.

The Library and Conversation Rooms will also, for the present, be open every Thursday evening, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings, both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
BONTECOU, DANIEL.....466 West Twenty-third street, New York City, N. Y.....	November 5, 1879.
DEMPSTER, ALEXANDER.....City Engineer, Pittsburg, Pa.....	" " "
RENO, JAMES H.....County Engineer, Court House, Pittsburg, Pa.....	" " "

CHANGES AND CORRECTIONS.

MEMBERS.

- HAVEN, WILLIAM A. Engineer in charge construction Buffalo Division N.
Y. L. E. & W. R. R., Buffalo, N. Y.
- MCComb, DAVID E. P. O. Box 289, Washington, D. C.
- MONROE, J. ALBERT. Mississippi River Commission, 1351 Washington ave-
nue, St. Louis, Mo.
- NICOLLS, WILLIAM J. Engineer Long Island Railroad, Jamaica, Queens
Co., N. Y.
- PARKHURST, HENRY W. Chief Assistant Engineer, Plattsmouth Bridge, Platts-
mouth, Nebraska.
- SCHMIDT, MAX E. Care of U. S. Engineers, Memphis, Tenn.
- SHINN, WILLIAM P. Vice President and General Manager Vulcan Iron
Works, 221 Oliver street, St. Louis, Mo.
- STANLEY, IRA N. 88 Van Dyke street, Brooklyn, N. Y.
- WHITFORD, OSCAR F. East Plattsmouth, Iowa.

ASSOCIATE.

- DU BARRY, EDMUND L. 621 Penn. Avenue, Washington, D. C.

JUNIORS.

- EMONTS, WILLIAM A. G. San José, Costa Rica, *via* Panama.
- HORTON, SANFORD. Engineer Department N. M. & S. P. R. R., Las
Vegas, New Mexico.
- ILLSLEY, WILLIAM A. P. O. Box 2353, Leadville, Colorado.
- KENNEDY, JAMES C. P. O. Drawer 33, Owen Sound, Ontario, Canada.
- STAHLBERG, ALBERT J. South Pacific Coast Railroad, foot of Market street,
San Francisco, Cal.
- WHINERY, SAMUEL. Assistant Engineer Elk River Shoals, Wheeler Sta-
tion, Lawrence Co., Alabama.

RESIGNATION.

- SCHUYLER, JOHN. October 18, 1879.

DEATH.

- WILLIAMS, NORMAN A. Elected Member February 17, 1869. Died October
12th, 1879.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. V.—December, 1879.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

NOVEMBER 19TH, 1879.—The Society met at 8 P. M., President A. Fink in the chair. A paper, entitled "Inter-Oceanic Canal Projects," by A. G. Menocal, Member Am. Soc. C. E., was read by the author and discussed by Messrs. Chanute, T. C. Clarke, Cooper, Emery, Fink, Ford, and Menocal.

DECEMBER 3D, 1879.—The Society met at 8 P. M., Vice-President Chanute in the chair. The awards of the Norman Medal and Book Prize for the past year were then announced as follows:

The Norman Medal to EDWARD P. NORTH, Member Am. Soc. C. E., for the paper, "*The Construction and Maintenance of Roads*," published in Transactions, Vol. VIII., No. CLXXX. (May, 1879).

The Norman Prize of Books to MAX E. SCHMIDT, Member Am. Soc. C. E., for the paper, "*The South Pass Jetties*," published in Transactions, Vol. VIII., No. CLXXXIII. (August, 1879).

Ballots for admission to membership were canvassed, and the following were declared elected as Members: Edward Canfield, of Buffalo, N. Y.; Henrique Harris, of Brooklyn, N. Y.; Thomas McKeown, of Hamilton, Ont., Canada; Charles L. Strobel, of Pittsburgh, Pa. Elected as Associate: L. M. Lawson, New York, N. Y.

The discussion on the subject of Inter-Oceanic Canal Projects was resumed and continued by Messrs. J. C. Campbell, Chanute, Emery, F. M. Kelley, Macdonald, Menocal, North, W. H. Paine, Shelborne and Worthen.

DECEMBER 17TH, 1879.—The Society met at 8 P. M., Vice-President Chanute in the chair. The discussion on the subject of Inter-oceanic Canal Projects was resumed. Papers were presented, through the Secretary, by Messrs. Evans, F. M. Kelley, M. E. Schmidt and C. A. Sweet, and the discussion was continued by Messrs. Long, Menocal, Appleton, Shelbourne, S. Stevens, and Peter Cooper.

CHANGES AND CORRECTIONS.

MEMBERS.

- HAVEN, WILLIAM A. Engineer in charge construction Buffalo Division N. Y. L. E. & W. R. R., Buffalo, N. Y.
- MCCOMB, DAVID E. P. O. Box 289, Washington, D. C.
- MONROE, J. ALBERT. Mississippi River Commission, 1351 Washington avenue, St. Louis, Mo.
- NICOLLS, WILLIAM J. Engineer Long Island Railroad, Jamaica, Queens Co., N. Y.
- PARKHURST, HENRY W. Chief Assistant Engineer, Plattsmouth Bridge, Plattsmouth, Nebraska.
- SCHMIDT, MAX E. Care of U. S. Engineers, Memphis, Tenn.
- SHINN, WILLIAM P. Vice President and General Manager Vulcan Iron Works, 221 Oliver street, St. Louis, Mo.
- STANLEY, IRA N. 88 Van Dyke street, Brooklyn, N. Y.
- WHITFORD, OSCAR F. East Plattsmouth, Iowa.

ASSOCIATE.

- DU BARRY, EDMUND L. 621 Penn. Avenue, Washington, D. C.

JUNIORS.

- EMONTS, WILLIAM A. G. San José, Costa Rica, *via* Panama.
- HORTON, SANFORD. Engineer Department N. M. & S. P. R. R., Las Vegas, New Mexico.
- ILLSLEY, WILLIAM A. P. O. Box 2353, Leadville, Colorado.
- KENNEDY, JAMES C. P. O. Drawer 33, Owen Sound, Ontario, Canada.
- STAHLBERG, ALBERT J. South Pacific Coast Railroad, foot of Market street, San Francisco, Cal.
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OF THE BOARD OF DIRECTION.

OCTOBER 31ST, 1879.—Applications for membership were considered. The Annual Report was perfected.

NOVEMBER 11TH, 1879.—The following committees were appointed: On Finance—William H. Paine, C. Vandervoort Smith, G. K. Warren. On Library—J. J. R. Croes, E. B. Van Winkle, O. Chanute.

Applications for membership were considered. The issue of a circular was authorized in reference to a record of members desiring engagements. Action was taken as to members in arrears for dues.

DECEMBER 5TH, 1879.—Applications for membership were considered. The Secretary was directed to issue copies of forms for applications, with a circular. Appropriations were made.

REPORT OF THE TREASURER

FOR THE YEAR ENDING NOVEMBER 5TH, 1879.

Presented and Accepted at the Twenty-seventh Annual Meeting.

RECEIPTS.

Balance on hand November 6th, 1878.....	\$749 51
Entrance fees.....	800 00
Fellowship subscription,.....	150 00
Current dues—from 82 Resident Members.....	\$2 000 00
Do. from 214 Non-resident Members.....	3 062 50
Do. from 3 Resident Associates.....	45 00
Do. from 8 Non-resident Associates.....	75 00
Do. from 7 Resident Juniors.....	82 50
Do. from 34 Non-resident Juniors.....	340 00
	5 605 00
Past dues—from 11 Resident Members... ..	\$350 00
Do. from 37 Non-resident Members.....	725 00
Do. from 1 Resident Associate.....	30 00
Do. from 1 Non-resident Associate.....	30 00
Do. from 4 Non-resident Juniors.....	40 12
	1 175 12

Dues for year beginning Nov. 5th, 1879:

From 22 Resident Members.....	\$550 00	
From 83 Non-resident Members.....	1 245 29	
From 1 Resident Associate.....	7 00	
From 3 Non-resident Associates.....	30 00	
From 1 Resident Junior.....	15 00	
From 12 Non-resident Juniors.....	120 00	
	<hr/>	\$1 967 29
Sales of Publications.....		566 28
Certificates of Membership.....		49 00
Advertisements.....		503 65
From former Secretary—Balance.....		65 00
Miscellaneous.....		29 00
Interest on Fellowship Fund Bonds.....	\$560 00	
Interest on Norman Medal Fund.....	70 00	
Interest on Savings Bank Deposit.....	40 31	
Interest on Railroad Stock.....	82 80	
	<hr/>	753 11
		<hr/>
		\$12 412 96
		<hr/>

DISBURSEMENTS.

Rent.....	\$1 600 00
Janitor, House Supplies, Fuel, Furniture, Water and Gas.....	981 23
Library.....	164 48
Publications.....	4 406 71
Insurance.....	34 23
Postage.....	545 24
Salaries.....	3 000 00
Stationery and Printing.....	502 91
Annual Meeting and Convention.....	235 47
Certificates of Membership.....	58 20
Other expenditures.....	157 12
Transferred to Savings Bank Deposit.....	40 31
Balance on hand.....	697 06
	<hr/>
	\$12 412 96
	<hr/>

The funds of the Society are as follows, par values being stated :

Fellowship Fund:

79 Subscriptions to Nov. 6th, 1878.....	\$8 000 00	
Accumulated interest to Nov. 6th, 1878.....	886 12	
Received during past year 1 Subscription.....	150 00	
“ “ “ “ Interest on bonds.....	560 00	
“ “ “ “ Interest from Savings Bank	40 81	
	<hr/>	
	9 636 43	
Expended from fund during year for publications.....	710 00	
	<hr/>	
	8 926 43	
Present condition: 80 Subscriptions.....	\$8 150 00	
Accumulated interest....	776 43	
	<hr/>	
		\$8 926 43

The Fellowship Fund is invested as follows:

8 Bonds Jersey City Water Loan.....	\$8 000 00
Deposit in Seamen's Bank for Savings.....	926 43

Norman Medal Fund:

1 Certificate Croton Aqueduct Stock, New York City.....	1 000 00
---------------------------------------------------------	----------

General Investment:

10 Shares New York Central and Hudson River R. R. Stock.....	1 000 00
1 Consolidated Certificate New York Central and Hud- son River R. R. Stock.....	35 00
	<hr/>
	1 035 00

J. J. R. CROES,
Treasurer.

REPORTS OF COMMITTEES.

REPORT OF THE COMMITTEE ON FINANCE.

PRESENTED AND ACCEPTED AT THE TWENTY-SEVENTH ANNUAL MEETING.

The Committee on Finance respectfully presents the following report for the year ending November 5th, 1879:	6th, 1878, to Nov. 5th, 1879, as reported is.....	\$11 663 43
The balance of funds on hand, as reported Nov. 6th, 1878, was	Balance on hand Nov., 1878.....	749 51
Cash.....	\$ 749 51	
Invested funds.....	10 921 12	
Total.....	\$11 770 63	
The amount of cash received from Nov.	Total.....	\$11 668 49
	Total.....	\$12 412 96
	Disbursements.....	11 715 90
	Balance on hand.....	697 06
	Invested funds.....	10 961 43

For the full details from which the foregoing has been condensed, you are respectfully referred to the Treasurer's Report.

One year since we were congratulated upon emerging from debt, to accomplish which it was necessary to economize, and curtail expenses in every possible direction, and thus the publication of our transactions remained sadly behind.

During the past year these have been brought up to date without involving us again in debt, so that the expenses of a year and a half of publishing has been borne during the past year, and we think it proper to remind the Society of the vast amount of

extra labor which has been done by the Secretary and Treasurer, who have had the principal labor of editing, publishing, and distributing so many columns in addition to the usual number in the same space of time.

We have found the accounts systematically and carefully kept, and so conveniently arranged that the labor of examination is greatly facilitated, with very little danger of errors occurring or escaping notice.

Very respectfully submitted,

W. H. PAINÉ,
C. V. SMITH,
GEORGE S. GREENE, } *Committee.*

REPORT OF COMMITTEE ON THE GAUGING OF STREAMS.

PRESENTED AT THE ANNUAL MEETING, NOV. 5TH, 1879.

The Committee have not yet been able to secure the desired co-operation of observers in communicating to the Society the results of continuous measurements of rainfall and flow of streams. There are, without doubt, many systematic observations made of the height of water in storage reservoirs and ponds used for city water supply and manufacturing purposes. With the aid of a few measurements giving the form and length of over-falls of dams, and the dimensions of pipes, gates, conduits, and race-ways, these notes could be made available for the information desired. The Committee again call the attention of members to desirability of collecting and forwarding all possible statistics on this subject, to be collated and put in useful shape. If the observers are unable, from want of time or other reasons, to reduce the notes, the original observations, if preserved in the Society, would furnish a mass of information which could be put into useful form by any one desirous of using it.

With a view to arousing more interest in the matter, the Committee have prepared some plain, practical suggestions to observers, which are offered for discussion and which it is proposed to issue to all who are in position to secure records of the kind desired.

Apart from the question of continuous records of flow, it is very desirable to have notes of the maximum and minimum discharge of streams of known water-shed. The records of this kind are scattered through reports and professional journals which are not easily accessible. Members are requested to furnish any memoranda of this kind to the Committee for collation and publication. Notes of the least flow and of the dry-weather flow of streams are greatly needed, the term "dry-weather flow" meaning the mean discharge during several weeks when the stream is at its lowest, and usually, though not always, including the period of 24 or 48 hours of least discharge.

There is probably a certain ratio existing between the area and the least flow which may be expected, depending more on the character of the water-shed than on either the mean or least recorded rain-fall.

We are not in possession of enough records to determine this ratio with any accuracy.

Such notes as we can obtain are presented in the following table, the publication of which may induce members of the Society and others to contribute additional memoranda on the subject :

TABLE OF THE LEAST FLOW OF STREAMS.

NAME.	Drainage Area, Square Miles.	Date of Observation.	Discharge in Cubic feet per Second per square mile.	AUTHORITY.
West Branch Croton River, New York.....	20.37	Aug. 31, 1870.	0.016	J. J. R. Croes.
Hale's Brook, Mass.....	24.	Sept. 7, 1876.	0.135	J. P. Frizell, evidence, Boston Water suits.
Sudbury River, Mass.....	76.3	July 21, 1876.	0.079	A. Fteley, " " "
Charles River, Mass.....	236.	Sept. 6, 1845.	0.183	J. P. Kirkwood, Mass. St. Bd. Health, 7th Rep.
Croton River.....	339.	Sept. 6, 1833.	0.178	Gauging by D. B. Douglass.
Concord River, Mass.....	352.	Sept. 14, 1876.	0.296	C. Herschel, evidence, Boston Water suits.
Hudsonic, Ct.....	790.	Oct. 15, 1878.	0.165	H. Loomis, Rept. N. Y. Com. Pub. Works, 1879.
Passaic, N. J.....	865.	Oct. 10, 1878.	0.208	J. J. R. Croes and G. W. Howell.
Schuylkill, Pa.....	1 800.	Sept., 1874.	0.210	E. F. Smith, Rept. Phila. Water Commissioners.
Merrimack.....	3 698.	July 25, 1840.	0.414	J. B. Francis, quoted by J. P. Kirkwood.
Connecticut.....	10 234.	Aug. 27, 1876.	0.521	T. G. Ellis, gauging for U. S. Govt.

TABLE OF FLOOD DISCHARGES OF STREAMS.

NAME.	Drainage area, square miles.	Date of observation.	Discharge in cubic feet per second per square mile.	AUTHORITY.
South Branch, N. Y.....	7.8	1869.	73.92	N. Y. State Counsel, Black River case.
Woodhull Reser., N. Y.....	9.4	1869,	77.76	"
W. Branch, Croton River.....	20.37	Jan. 7, 1874.	54.43	J. J. R. Croes.
Cochituate, Mass.....	19.	1869.	17.38	J. P. Davis.
Watuppa Lake, R. I.....	28.5	June 10, 1875.	72.00	W. Rotch.
Flat River, R. I.....	61.	1843.	120.75	J. H. Shedd.
Sudbury, Mass.....	76.3	March 26, 1876.	42.17	A. Foley.
Nashua, Mass.....	84.5	....	71.14	E. Sawyer.
Nashua, "	109	1848.	104.50	"
Nashua, S. Br., Mass.....	122	1870.	56.21	"
Pawtuxet, R. I.....	190	1867.	56.85	J. H. Shedd.
Croton, N. Y.....	339	April 20, 1854.	74.87	Calculated from Reports Croton Aq. Dept.
Black River, N. Y.....	523	1869.	36.80	N. Y. State Counsel, Black River case.
Passaic, N. J.....	881	Dec. 12, 1878.	20.33	J. J. R. Croes.
Merrimack, Mass.....	4 136	1852.	23.40	C. Herschel.
Connecticut, Ct.....	10 234	May, 1854.	20.27	C. Herschel.

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Croton River.....	339.	Sept. 6, 1833.	0.178	Gauging by D. B. Douglass.
Concord River, Mass.....	352.	Sept. 14, 1876.	0.296	C. Herschel, evidence, Boston Water suits.
Housatonic, Ct.....	790.	Oct. 15, 1878.	0.165	H. Loomis, Rept. N. Y. Com. Pub. Works, 1879.
Passaic, N. J.....	855.	Oct. 10, 1878.	0.208	J. J. R. Croes and G. W. Howell.
Schuylkill, Pa.....	1 800.	Sept., 1874.	0.210	E. F. Smith, Rept. Phila. Water Commissioners.
Merrimack.....	3 698.	July 25, 1840.	0.414	J. B. Francis, quoted by J. P. Kirkwood.
Connecticut.....	10 234.	Aug. 27, 1876.	0.621	T. G. Ellis, gauging for U. S. Govt.

TABLE OF FLOOD DISCHARGES OF STREAMS.

NAME.	Drainage area, square miles.	Date of observation.	Discharge in cubic feet per second per square mile.	AUTHORITY.
South Branch, N. Y.....	7.8	1869.	73.92	N. Y. State Counsel, Black River case.
Woodhull Rest., N. Y.....	9.4	1869,	77.76	"
W. Branch, Croton River.....	20.37	Jan. 7, 1874.	54.43	J. J. E. Croes.
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Nashua, "	109	1848.	104.50	"
Nashua, S. Br., Mass.....	122	1870.	56.21	"
Pawtuxet, R. I.....	190	1867.	56.83	J. H. Shedd.
Croton, N. Y.....	339	April 20, 1854.	74.87	Calculated from Reports Croton Aq. Dept.
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Merrimack, Mass.....	4 136	1852.	23.40	C. Herschel.
Connecticut, Ct.....	10 334	May, 1854.	20.27	C. Herschel.

While a knowledge of the probable least discharge is desirable in connection with questions of water supply and water power, the greatest probable flood discharge of streams is important to be known in connection with the designing of all structures over or in flowing waters.

Reliable notes on this subject are also very rare. Several efforts have been made to determine formulæ expressing the discharge in terms of the drainage area, but without much success.

In the accompanying table a number of observed maximum discharges of American streams are arranged according to size of drainage area. Several of these are taken from the paper by J. H. Shedd in *Transactions A. S. C. E.*, Vol. IV, p. 301, but with the discharge given in cubic feet per second per square mile of area instead of per minute per acre. It is believed that the number of instances of extraordinary freshets can be largely increased by contributions from mem-

bers having such records in their possession.

In remarkable contrast with the discharges in this table is that of the Seine in France, in the flood of March 17, 1876, which was said to be the greatest since 1807, and in which the discharge was only 3.48 cubic feet per second per square mile. The drainage area is 16 860 square miles. (*Annales des Ponts et Chaussées*, Vol. XIII, p. 435.)

It will be observed that all of the streams above named are in the Northern Atlantic States.

It is an interesting subject of inquiry whether the same general rule will apply to the maximum and minimum discharge of streams in this region and those in the Southern Atlantic Slope, and those in the Mississippi Valley and on the Pacific Slope. The Committee request memoranda bearing on this subject.

J. JAMES R. CROES,
Chairman.

AWARD OF THE NORMAN MEDAL AND NORMAN BOOK PRIZE

FOR THE YEAR ENDING AUGUST 1st, 1879.

Competition for the Norman Medal has heretofore been restricted to papers offered especially for that purpose. Under the new Code of Rules adopted by the Board of Direction, with the approval of the donor of the Medal Fund, George H. Norman, Member and Fellow of the Society, all the original papers presented to the Society by members of any class during the year ending August 1st, 1879, have been submitted to a Board of Censors, designated as directed by those rules. This Board for the past year was composed of the following members of the Society: E. S. Chesbrough, Charles Paine, C. Shaler Smith. The Board reports that the Norman Medal should be awarded to EDWARD P. NORTH, Member Am. Soc. Civ. Eng., for the paper "*The Construction and Maintenance of Roads.*" The Norman Prize of Books to MAX E. SCHMIDT, Member Am. Soc. Civ. Eng., for the paper "*The South Pass Jetties.*" The Board also reports that several of the other papers presented during the year are deserving of high praise.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

CANFIELD, EDWARD.....	Assistant Engineer, N. Y., L. E. & W. R. R., Mansion House, Buffalo, N. Y.....	December 3, 1879.
HARRIS, HENRIQUE	Chief Engineer, N. Y. & Manhattan Beach Railroad, 402 Sackett street, Brooklyn, N. Y.....	" " "
LOOMIS, HORACE.....	Assistant Engineer, Department of Public Works, Room 11½ City Hall, New York.....	November 5, 1879.
McKEE, CHARLES H.....	Assistant Engineer, Delaware & Hudson Canal Co., Albany, N. Y.....	June 4, 1879.
McKEOWN, THOMAS.....	Chief Engineer, Marquette & Mackinaw R. R., Detroit, Mich.	December 3, 1879.
MITCHELL, HENRY	Chief of Physical Hydrography, U. S. Coast Survey, 1 Ellis street, Roxbury Station, Boston, Mass..	January 7, 1880.
NICHOLS, AURIN B.....	Engineer of Railroads, Department of the Interior, Washington, D.C.	" " "
ROCKWELL, SAMUEL.....	Civil Engineer, 18 East Fourteenth street, New York City, N. Y...	" " "
STROBEL, CHARLES L.....	Principal Assistant, Keystone Bridge Co., Pittsburg, Pa.....	December 3, 1879.

ASSOCIATE.

LAWSON, LEONIDAS M.....	92 Broadway, New York.....	December 3, 1879.
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CHANGES AND CORRECTIONS.

MEMBERS.

BILLIN, CHARLES E.....	4039 Locust street, Philadelphia, Pa.
BROWN, CHARLES O.....	Tunja, United States of Colombia.
BUCK, LEFFERT L.....	1632 Rhode Island avenue, N. W., Washington, D. C.
BURDEN, JAMES A.....	139 Fifth avenue, New York City, N. Y.

- DORSEY, EDWARD B. 61 Broadway, New York City, N. Y.
 GREENE, GEORGE S. 94 Chestnut street, Boston, Mass.
 KATTE, WALTER. Chief Engineer, New York Elevated Railroad, 6 Bow-
 ling Green, New York City, N. Y.
 KNAPP, LOUIS H. Deputy City Engineer, 410 Franklin street, Buffalo,
 N. Y.
 MACLEOD, JOHN. 547 Second street, Louisville, Ky.
 McDOWELL, NATHAN M. Alleghany City, Pa.
 OSGOOD, JOSEPH O. Division Engineer, N. M. & S. P. R. R. Care of A. A.
 Robinson, Esq., Chief Engineer, Pueblo, Colorado.
 RICHARDSON, HENRY B. Assistant Engineer, Board of State Engineers, St.
 Joseph, Tensas Parish, La.
 STAUFFER, D. McN. Contractor's Office, Dorchester Bay Tunnel, Boston,
 Mass.
 TALCOTT, COOK. Chief Engineer, Astoria & Winnemucca Railroad, P.O.
 Box 446, Portland, Oregon.
 WALLING, HENRY F. Eaton, Preble Co., Ohio.

FELLOW.

- GILMAN, CHARLES C. President Hawkeye Telegraph Co., Eldora, Iowa.

DEATH.

- EDGE, GEORGE W. Elected member March 4th, 1874. Died January 1st,
 1880.



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